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Contents

PAGE

EDITORIAL NOTES: Safety Measures in Chemical Works; Opposition to the I.G. Corporation; The Move Towards Fewer Meetings; Chemical Warfare 441
Deconcentration: An Aspect of Boiler Control, by Technicus 443
The Low Temperature Preservation of Foodstuffs 445
The Dead Sea Concession: Draft Agreement 446
Merchandise Marks for Glassware: Continuation of Hearing 447
Correspondence: "? A Correction Needed" 450
From Week to Week 451
References to Current Literature 452
Patent Literature 453
Weekly Chemical Prices and Market Reports 456
Company News 460
Commercial Intelligence; New Companies Registered 462

DYESTUFFS MONTHLY SUPPLEMENT: Rayon—The Growth and Development of a Great Industry, by A. B. Shearer, etc. 33-40

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Safety Measures in Chemical Works

OUR attention has been drawn to a new and very important activity of the Association of British Chemical Manufacturers. Some months ago the council of the Association decided on what is believed to be a novel step, viz., to prepare and issue to its members a set of model safety rules for use in chemical works. These rules are to be in two parts: Part I—*Model Rules*, which shall give, in concise form, the various principles which should be applied in the erection and operation of chemical plant with a view to preventing accident and safeguarding the workers; and Part II—*Detailed Instructions*, which shall consist of a more extended explanation of the objects to be obtained by the rules, the dangers arising from their non-observance, and the best or most convenient method of obtaining the desired result. In other words, it is the intention in Part II to bring together, for the benefit of chemical employers, the accumulated experience, in regard to safety measures, of the industry and of the Government departments concerned with such matters.

It is understood that the Home Office is collaborating in the preparation of this book and is placing its experience at the disposal of the Association. Part I has now been completed in provisional form, and has been issued to all members in a booklet of convenient size and shape for the pocket. The preparation of Part II is in hand, and it is expected that it will be completed by the end of the year.

The subject matter will cover a wider field than the Chemical Works Regulations, 1922, and will deal with all chemical manufacture except that of authorised explosives, for which special statutory safeguards are already imposed. These rules should be of great benefit to the industry, and the Association is to be complimented on setting an example, which other industries might well follow, in regard to the safety and welfare of employees. Work of this nature should do much to improve the relationship between capital and labour, and is deserving of the greatest encouragement. The heavy task of drawing up the model safety rules is being undertaken by the works' technical committee of the Association, which is a strong and representative body under the chairmanship of Dr. E. F. Armstrong, F.R.S.

Opposition to the I.G. Corporation

THE party who have stood in the United States for an independent American chemical industry and make no concealment of their desire to secure that by protective devices, are not at all pleased about the formation of the new American I.G. Corporation. Mr. Francis P. Garvan, formerly Alien Property Custodian and founder and present head of the American Chemical Foundation, acknowledging on Saturday in New York the presentation to him of a medal by the American Institute of Chemistry for outstanding achievement in science and the profession of chemistry, strongly criticised the new Corporation and attacked the group of American bankers who participated in its formation for assisting the German Dye Trust (I.G. Farbenindustrie) to launch a fresh war for the destruction of the American chemical industry and the recapture of the market. He declared that after the fight to emancipate the United States from German domination in the chemical field certain business men and bankers were utilizing the $30,000,000 funds under their control to help the dye trust to cut the throat of American chemical independence, to destroy the progress made in domestic chemistry since 1915, and, incidentally, to undermine the defence resources of the country. He said that the formation of the American I.G. was an affront to every man, woman, and child in the United States, and that the fight against the German dye trust must begin again and be carried to Congress and the people. The strong terms used suggest a feeling of real alarm and rather a lack of confidence in the strength of the home industry. Nor does Mr. Garvan's attitude altogether agree with other opinions that have been expressed. The view has been definitely put forward that, while America would object to the flooding of the home market with com-

petitive imports, whether German or other, there would be no objection, or at least a considerably modified objection, to the establishment of works in the United States. The Chemical Foundation, it may be remembered, was the body that took over all the German chemical patents confiscated in America during the war.

The Move Towards Fewer Meetings

At the annual meeting last year of the American Chemical Society a member with a wide experience of these great gatherings declared that one of the most-needed reforms was a drastic reduction in the number of sections and the number of papers. Any visitor would easily understand such a desire. Looking at the immense chart of the sections sitting simultaneously, he would be reminded of the list of classes of a great university or the daily list of cases set down for hearing in the High Court. He would note a hundred different subjects, each in charge of some selected expert, that he would be equally anxious to hear discussed, and he would have to be content with one and to leave the remaining ninety and nine.

It must be confessed, from the lists of subjects for discussion at the 77th annual meeting of the Society at Columbus (Ohio) this month, that the process of compression does not appear to have made much progress. Something has been done to meet the difficulty by the circulation of an immense number of well-prepared abstracts, but even so the attempt to cover such a wide field seems almost hopeless, or, if persisted in, threatens a bad attack of mental indigestion. These immense programmes covering several days are largely the product of the modern science of organisation, and there is a danger that the student who wants some definite objective will miss it altogether in the vastness of the organisation itself. There will, we fancy, presently be a decided reaction in favour of something simpler and more manageable which will enable people to concentrate on one thing at a time. Compared with the American programme, that of the Manchester meeting in July looks less impressive, but to many it will also look much more possible. Most of its features can be conveniently covered by every visitor, and the serious business is liberally spaced out with recreations.

Nor is the organisation of chemical interests in the United States quite so simple as English speakers sometimes suggest. In the American Chemical Society, it is true, American chemistry, scientific and applied, is magnificently centralised. Yet even there the desire exists for variety. At the dinner given the other evening at the Chemists' Club, New York, to Dr. Arthur D. Little, no fewer than four separate organisations co-operated—the Society of Chemical Industry (representing a British organisation), the American Chemical Society, the American Electrochemical Society and the Société de Chimie Industrielle (representing a French organisation).

Among other organisations may be mentioned the American Institution of Chemical Engineers—in the United States an entirely independent body. If, in fact, we followed American procedure, we should not reduce but actually have to add to the existing chemical denominations a British Section of the American Chemical Society, for which there are probably enough members resident in this country, and a branch of the French Society of Chemical Industry. But the British chemical appetite for diversity in unity is probably satisfied already.

Chemical Warfare

The announcement by Lord Cushendun at Geneva last week that the British Government had decided to ratify at once the Protocol of 1925, which prohibits the use of poison gas and analogous methods of waging war will be received with general satisfaction. Altogether 18 States out of the 50 members of the League of Nations have now ratified the Gas Protocol, among those that still stand outside being the United States. The British ratification is limited to those other States which have ratified the Protocol. It is obvious from this limitation that preparations for what is called "gas warfare," with the chemical research that those preparations involve, are not to be suspended. Some light was thrown on the experimentation on living animals at the Porton and Sutton Oak chemical warfare experimental stations, by a question asked in the House of Commons by Mr. Wellock. A return which the Secretary of State for War caused to be circulated shows that the number of animals and birds used for experimental purposes at Porton during the period November 1, 1926, to April 20, 1929, was 1,184. They included rabbits (345), goats (7), guinea-pigs (525), cats (37), monkeys (1), mice (153), canaries (40), pigeons (46), and fowls (30). It will be observed that dogs do not appear in the list. Of the 1,184 creatures experimented on 440 were killed by the experiments—76 rabbits, 1 goat, 139 guinea-pigs, 8 cats, 108 mice, 40 canaries, 38 pigeons and 30 fowls. It may be added that while all the canaries and fowls used were killed, a very considerable number of other creatures survived. No experiments on living creatures took place at the Sutton Oak Research Establishment during the period covered by these statistics.

The Calendar

May 14	Institution of Petroleum Technologists. 5.30 p.m.	John Street, Adelphi, London.
15	Royal Society of Arts: "The Reform of the British Patent System." Robert Burrell. 8 p.m.	John Street, Adelphi, London.
15	Society of Glass Technology: Annual Dinner.	London.
16	Chemical Society. 8 p.m.	Burlington House, London.
17	Institute of Chemistry (Belfast Section): Annual General Meeting.	Belfast.
19	Society of Dyers and Colourists (Manchester Section): Annual Meeting. 7 p.m.	36, George Street, Manchester.
23	Faraday Society: Annual General Meeting. 7.45 p.m.	Burlington House, London.
24-25	Institute of Chemistry and Society of Chemical Industry: Joint Scottish Meeting.	Glasgow.
30	Chemical Society: Pedler Lecture by Professor W. H. Perkin. 5.30 p.m.	Burlington House, London.
June 6	Chemical Society. 8 p.m.	Burlington House, London.

Deconcentration: An Aspect of Boiler Control.—(I)

By Technicus

However much attention be paid to the softening or other pre-treatment of boiler water, the progressive increase in its content of soluble salts still requires attention. An exhaustive discussion of this aspect of boiler control appears below.

An analysis of a proposed boiler-feed or make-up water will reveal the necessity or otherwise for some treatment, with a view to avoiding scale troubles in economisers and boilers and to removing certain permanent hardness salts which may be looked upon as accelerators of corrosion. Such an examination will indicate at the same time whether the treatment should be supplemented or not by chemical coagulation, in order to remove suspended substances whose state of division is too fine to permit of their removal by natural subsidence.

If it be assumed that a boiler-feed or make-up water, if not naturally suitable for such purpose, has been improved in quality by some appropriate pre-treatment on the lines indicated, and that scale-formation and the acceleration of economiser- and boiler-corrosion by certain of the permanent hardness salts have thus been legislated against, the fact should not be overlooked that the progressive increase in the saline concentration of the water in the boiler still remains a matter which demands constant attention and control.

Perhaps the one exception to this is to be found in those cases where the make-up is evaporated. Even then the necessity for vigilance with respect to the saline concentration of the boiler water may not be entirely precluded; for instance, a small persistent condenser leakage may obtain, and it is possible for some types of evaporator to prime. It may be mentioned that the treatments referred to do not include the use of the so-called boiler compounds, the employment of which, in the opinion of the author, cannot be regarded generally as good practice, for reasons which will be apparent from what is to follow.

Softening

With an untreated feed or make-up water, a control of the concentrations of soluble and suspended solids in the boiler is essential, in order to minimise scale-formation and sludge accumulation, and to safeguard against priming. With a chemically pre-treated water, i.e., excluding an evaporated make-up, a similar control is still necessary, in order to avoid as far as possible the transference of saline materials from the boiler to other units of the plant by priming and foaming. The likelihood of the occurrence of these two phenomena is greatly enhanced as the concentrations of dissolved and suspended matters in the boiler water increase, and it should not be forgotten that chemical softening may have little or no influence so far as the reduction of the saline concentration of the water treated is concerned. In fact, where the treatment is directed mainly towards the removal of permanent hardness, its effect is actually to increase the original saline concentration, whilst if "zeolite" or base-exchange softening is employed, even the temporary hardness, as well as the permanent hardness, is replaced by sodium salts in amounts greater than those of the alkaline earth salts removed. Moreover, no process of chemical softening has any influence whatsoever on the sodium salts originally present in the water; these persist, and their original concentrations are supplemented by softening as already indicated.

The most commonly occurring of these sodium salts is the chloride, and the behaviour of this salt as an accelerator of corrosion under certain conditions requires no comment.

The following example will serve to show how the concentration of the soluble salts in a raw water supply is affected by lime-soda treatment and by zeolite or base-exchange treatment:—

Raw Supply.	Water Resulting from Lime-soda Treatment.	Zeolite Treatment.
$CaCO_3$. 9.0 gr/gall.	——	Na_2CO_3 .9.54 gr/gall.
$CaSO_4$..11.0 gr/gall.	Na_2SO_4 11.5 gr/gall.	Na_2SO_4 .11.5 gr/gall.
$MgCO_3$ 5.0 gr/gall.	——	Na_2CO_3 .6.30 gr/gall.
$MgSO_4$. 9.0 gr/gall.	Na_2SO_4 10.65 gr/gall.	Na_2SO_4 10.65 gr/gall.
NaCl .. 8.0 gr/gall.	NaCl .. 8.0 gr/gall.	NaCl .. 8.0 gr/gall.
Total Solids .42.0 gr/gall.	30.15 gr/gall.	50.0 gr/gall.

In the example chosen, lime-soda softening has reduced the concentration of total solids by approximately 25 per cent., but it will readily be seen that this is due to the ratio existing between the temporary and permanent hardness in this example, and that as the latter increases the reduction in concentration of soluble salts in the treated water will decrease. The increase in concentration of soluble salts due to zeolite softening is well illustrated. By neither process of softening is a water produced the use of which as make-up or feed water will preclude the need for control with respect to the limitation of the concentration of salts in the boiler, particularly in modern plant where pressures and rates of evaporation are high.

Salt Transference

The dangers attendant upon the transference of salts from the boilers to other units, as well as in those cases where the steam may be used for process purposes, are apparent to all whose activities necessitate familiarity with such plant, and it is not the writer's present purpose to discuss these but to deal, instead, with the means available for their avoidance.

It may perhaps not be fully appreciated to what extent the transference of salts from the boilers may occur, and the following case is therefore given as an example, the assumed data being such as may be ordinarily met with:—

Assume (*a*) an evaporation of 40,000 pounds per hour; (*b*) A boiler water concentration of 100 grains per gallon; (*c*) 1 per cent. wetness in the steam leaving the boiler.

The weight of actual water leaving the boiler per hour as wetness in the steam is 400 pounds or 40 gallons; the weight of salts contained in this water is $40 \times 100 = 4000$ grains or $\frac{4}{7}$ pounds. If the boiler is operating for, say, 75 per cent. of the total hours possible per year (i.e. 8760×0.75), then the weight of salts transferred from it per annum will be found to be, on the above data, 1.68 tons.

Priming and Foaming

The foregoing example illustrates what may occur in the absence of priming, as the term is generally understood. If conditions in the boiler, and of the boiler water, are such as to induce a steady foaming, the position is aggravated, owing to the increased wetness of the steam thereby occasioned.

"Priming" and "foaming" are two terms which are used, by engineers, often synonymously, to describe those conditions which may arise during operation, and which effect an abnormal transference of water from the boiler with the steam. Water is always carried away with the steam from the boiler even though there be no priming or foaming, for it is obvious that the water forming the skin of steam bubbles, which becomes "atomised" when the bubbles break, cannot all return to the bulk of water in the boiler; a proportion is entrained in the steam owing to the velocity of the current of vapour into which it is projected.

"Priming," strictly defined, is the ejection of water from the boiler in excessive or abnormal quantities owing to sudden changes in the rate of ebullition. These changes may be either local or general in character, and may be attributed to a variety of causes, such as sudden heavy steam demands or local superheating, arising, for example, from the detachment of a large piece of boiler scale. When exceptionally severe, priming is often referred to as "bumping."

"Foaming," on the other hand, is a condition in which a stable froth or foam persists on the surface of the water in the boiler, and while its effects as regards the increase of the quantity of water discharged from the boiler with the steam are less severe than in the case of priming, it should be remembered that while the latter is occasional or intermittent in occurrence, and is often readily apparent to those in charge of the plant, foaming can persist over a prolonged period of operation, while its detection is not easy. In fact, the occurrence of foaming is not, as a rule, detected until some unit of the plant beyond the boilers is opened up for inspection; and it is probable that comparatively few engineers have a true conception of its real nature.

Both priming and foaming may be influenced to varying degrees by the construction of the boiler and the mode of its operation, but the phenomena are more closely associated with

and dependent upon the concentrations of soluble and suspended solids in the boiler water; in fact, the ability to foam is primarily dependent upon the presence of such solids in concentrations above what would appear to be a very low limit.

Conditions Upon Which Foaming Depends

The opinion is still held by many that a high concentration of sodium salts, particularly of the alkaline salts, is alone capable of inducing foaming and also priming. Latterly, however, the theory that foaming is attributable to the concentration of dissolved salts in addition to the presence of suspended matter has gained favour. While many cases of foaming appear to be due to such combination, the opinion may be put forward that the data available from our present theoretical knowledge and practical experience are insufficient to permit of a definite statement as to what condition or conditions are necessary to enable foaming to occur.

Perhaps the most rational way of regarding this question is from the standpoint that the production of a foam is associated with changes in surface tension of the liquid. Freundlich (*J.S.C.I.*, 1890, **52**, 1) holds the view that low vapour pressure, low surface tension and high surface viscosity are necessary for foaming. It follows that if concentrations in the liquid films enclosing the steam bubbles on the main water surface differ from that in the bulk of the water, then foaming can occur. A moment's consideration is sufficient to indicate that the concentrations in such films must differ from the concentration in the bulk of the liquid, and hence all true solutions may be expected to foam if changes in concentration induce a sufficiently pronounced change in surface tension. The presence of finely-divided suspended substances in conjunction with material in solution tends to stabilise the foam, and if such suspended matter is present it would appear that relatively low concentrations of soluble salts can be compatible with foaming. Foaming may be expected where changes, either increments or reductions, occur in the surface concentrations of the boiler water, but such foam will not be stable. The presence of suspended substances stabilises the liquid films surrounding the steam bubbles, and both accelerates foaming and ensures the persistence of the foam.

Bancroft (*Applied Colloid Chemistry*, McGraw-Hill, 1921, pp. 269-270), summarises foam formation in the following manner:—"To get a foam the only essential is that there shall be a distinct surface film, in other words, that the concentration in the surface layer shall differ perceptibly from that in the mass of the liquid. All true solutions will therefore foam if there is a marked change of surface tension with concentration, regardless of whether the surface tension increases or decreases. All colloidal solutions will foam if the colloid concentrates in the interface, or if it is driven away from the interface. To get a fairly permanent foam the surface film must either be sufficiently viscous in itself or must be stabilised in some way. This can be done by introducing a solid powder into the interface."

A clean boiler, fed with clean softened water, is unlikely to exhibit foaming, even though the saline concentration be fairly high, but a dirty boiler, fed with the same water, or a boiler fed with dirty water, will exhibit foaming because of the stabilising influence of the suspended substances. Traces of soap or of fatty acids concentrate in the surface layers and cause foaming.

Increase in Saline Concentration

While there is yet much which is not perfectly understood with regard to foaming, it is clear that the obvious way to tackle the practical aspect of the problem is to operate the boilers on a water which will not foam, and this can be best ensured if limits are determined and maintained on the concentrations of dissolved and suspended substances in the boiler water.

It may not be generally appreciated how rapidly the saline concentration (and similarly the concentration of suspended substances) of a boiler can increase. Consider the case of a boiler of 50,000 pounds capacity, at normal working level and evaporating an average of 40,000 pounds per hour. Assume a make-up of 5 per cent., and that the make-up water contains soluble salts to the extent of 10 grains per gallon. For the purpose of this illustration let us regard the initial concentration of the boiling water as nil, and calculate the number of hours' steaming required to raise the concentration to 100 grains per gallon in the boiler water.

The volume of make-up per hour is 200 gallons, containing 200×10 grains of salts. Hence, the number of hours' steaming required to give a boiler water concentration of 100 grains per gallon is:—

$$\frac{5{,}000 \times 100}{2{,}000} = 250 \text{ hours} = 10.5 \text{ days.}$$

or, say, one and a half weeks' steaming.

Control of Boiler Water Concentration

A control over the concentrations of soluble and suspended solids in a boiler water can be exercised in several ways:—(1) By evaporation of the make-up water; (2) by instituting a regular periodical blow-down of predetermined amount; and (3) by employing a continuous blow-down system.

Before proceeding to discuss these alternatives, attention may be drawn to certain devices which, though not actually designed to effect deconcentration of the boiler water, yet have some influence tending to reduce the seriousness of too high a concentration on other units of the plant beyond to the boilers. These devices may be grouped under the general category of steam purifiers, and may be considered as a rule to be integral with the boiler. Though varying widely in detail of individual design, they consist essentially of a series of baffles fitted into a container which is placed between the boiler steam outlet and the main steam range. They are designed primarily to reduce the wetness of the steam leaving the boiler, but in effecting such reduction, which involves the return of a proportion of the water in the steam to the main bulk of water in the boiler, they clearly must effect also a proportionate reduction in the amount of saline (and suspended) substances permitted to escape with the steam. Examples of this type of equipment are to be found in the Tracey Steam Purifier and in the Schutte and Koerting Purifier.

In addition, there are available certain types of deconcentrator which, however, are effective only in so far as the suspended substances are concerned. Such equipment comprises a small pressure filter through which a proportion of the boiler water is continually passed, filtered, and then returned to the boiler. The filter is cleaned when required by reversing the flow of water and running the wash water to waste.

The use of anti-foaming compounds, which consist usually of emulsions of organic compounds, for instance, of castor oil, falls under the category of boiler compounds, and will not appeal to the majority of those responsible for boiler plant. An exception may perhaps be conceded in the case of locomotive boilers and the like, where other correctives are not applicable, and of small boilers of the donkey engine type.

Evaporation of Make-Up

In a plant in which the condensate forms the major portion of the boiler-feed, evaporation of the make-up, which in such cases will average from, say, 2 to 5 per cent. of the total volume of the feed water, most nearly approaches the ideal, but, as already stated, even in cases where this is the procedure followed, the need for vigilance over boiler concentrations is not necessarily precluded. In the example cited to illustrate the rate at which the concentration of a boiler water may increase, it will be noted that, with a 5 per cent. make-up containing 10 grains per gallon of salts, the concentration thereby occasioned in the feed water is 0·5 grains per gallon. If a plant is using sea-water for condenser circulating water, then taking the saline concentration of sea water as 2,500 grains per gallon, a condenser leakage of 0·2 per cent. will suffice to give a condensate or feed water whose saline concentration is also 0·5 grains per gallon. Hence, in spite of evaporation of the make-up, we have a case similar to the one given earlier as regards the rate of increase of saline concentration of the boiler water.

It is not proposed to discuss here the various types of evaporators available for the purpose under consideration; the variety is large, ranging from the use of an independent boiler (which, incidentally, may be regarded as an illustration of an evaporator with foaming and priming tendencies or capabilities) such as is met with in marine practice, to the multiple-effect evaporators, of which the Mirlees-Watson type may be cited as an example.

(To be concluded)

The Low Temperature Preservation of Foodstuffs

Annual Meeting of the London Section of the S.C.I.

The annual meeting of the London Section of the Society of Chemical Industry was held at Burlington House, Piccadilly, on Monday, Mr. W. J. A. Butterfield (chairman of the Section) presiding. As already announced, Professor G. T. Morgan has been elected chairman of the Section in succession to Mr. Butterfield, who was cordially thanked for his services during the past two years. Mr. R. T. Colegate (hon. secretary and treasurer) was accorded a hearty vote of thanks for the work he had done for the section as honorary secretary and treasurer, which offices he retains.

THE Chairman (Mr. W. J. A. Butterfield) mentioned that during the next session, which begins in October, an address would be given to the Section by Dr. Levinstein (who had been nominated as President of the Society), and that a number of papers on a variety of topics had also been secured to cover the whole session with the exception of one or perhaps two meetings. He asked members to submit papers to complete the series.

Dr. Moran's Paper

In calling upon Dr. T. Moran to read a paper on "Recent Advances in the Low Temperature Preservation of Foodstuffs," the chairman said it had been hoped that Sir William Hardy would be present to give an introductory address, but unfortunately his arrangements did not permit of it. Sir William, however, had sent in some notes which would be read later.

Dr. Moran, who dealt with the subject from the point of view of the work that was being done in the laboratory in regard to refrigeration and preservation by cold, said the most important single factor entering into preservation was temperature, and he confined himself almost solely to that aspect, dividing his considerations of the problem into the preservation of living foodstuffs, such as fruits, eggs, etc., and dead foodstuffs, such as meat, etc. He showed how the effect of temperature upon living systems had a two-fold effect—viz., as regards the rates of the reactions taking place and as regards the equilibrium state of the system. He indicated that researches at Cambridge showed clearly that for living foodstuffs the temperature must in most cases be slightly above the freezing temperature, although the optimum storage temperature varied with different classes of foodstuffs.

The Equilibrium State

It was in this latter relation that it was necessary to consider how temperature could affect the equilibrium state of the living organism. Curves obtained as the result of careful researches were shown, and they all indicated that there was but a limited range of temperature available in the preservation of living foodstuffs coming within the first category mentioned by Dr. Moran. It was only recently that experiments had been started to follow the actual chemical changes in living foodstuffs stored at different temperatures, and the data now being accumulated would throw considerable light on the effect of temperature and conditions of storage on the quality and flavour of food.

The problems associated with dead foodstuffs were not so difficult, the main object being to restrict the activity of moulds, bacteria, etc., and also to control the extent of structural changes. It had been shown that below a certain optimum temperature the rate of growth progressively diminished. In the storage during transport of such things as chilled meat, humidity played an important part, and a balance had to be struck, because if the temperature were too high there was excessive growth of mould and bacteria, while if it were too low there was wastage in other directions. Thus the elimination of mould growth was largely a question of control of the atmospheric conditions, but a great deal of research was still needed on the whole problem.

One important point needing investigation was whether it was possible by thawing to obviate the damage done by freezing. The curves shown by the author clearly indicated the fundamental importance of temperature in regard to the preservation of foodstuffs as affecting the chemical processes and change produced in the frozen state, and the author concluded by stating that although he had only approached the matter from the laboratory point of view there was a wide field for work on the part of the biological engineer in applying the results obtained in the laboratory in practice.

Sir William Hardy, in the course of his written contribution, said that the author had used a term which invited comment—namely, "the biological engineer." Ten years' work on the science of the preservation of food had compelled those working under the Food Investigation Board to recognise the existence of problems which formed a field of work sufficiently distinct to deserve not only its own title but its own organisation. "Biological engineering" was not a pretty title, but it marched well with its senior, "chemical engineering." The task of biological engineering was not easy. For its fulfilment three variables needed to be exactly controlled—temperature, humidity, and the composition of the air with respect to the permanent gases and the content of bacteria, and the difficulties involved in the large scale control of these need not be stressed.

Enzyme changes were not physiologically or medically suspect. Indeed, it was to enzyme changes that we owed the improvement in the condition of meat which came from hanging. These changes could be controlled and even arrested by cold, and the craftsmanship of storage of meat and fish lay largely in that kind of control which yielded for the consumer the most palatable product.

Discussion

Dr. Lampitt said that the change of public opinion, which, quite rightly, would not allow of the use of chemical preservatives, had led to the need for a more scientific study of refrigeration than had previously been the case, and he regarded this as a field for chemical industry the extent of which had not yet been appreciated. The work that was being done at Cambridge would have far-reaching effects, if only for the reason that it was stimulating manufacturers to provide more scientific refrigeration apparatus. The theories that were being worked out were leading gradually to a true appreciation of the problem, and not the least important was the question of whether by thawing under suitable conditions the foodstuff could be brought back to its original state. The whole problem of preservation by cold was a vast one, and the work being done at Cambridge, so far as his experience went, was founded on very sound bases.

New Principal of Edinburgh University

SIR THOMAS HOLLAND, Rector of the Imperial College of Science and Technology, London, has been appointed principal of Edinburgh University in succession to Sir J. Alfred Ewing. Sir Thomas Holland, who is at present in South America, is a Canadian, who received his scientific training at the Royal College of Science, South Kensington. He settled in India in 1890, and became president of the Mining and Geological Institute of India, director of the Geological Survey, and chairman of trustees of the Indian Museum. More than thirty years ago he read his first paper before the British Association. In 1914, when the association met in Australia, he was president of the Geological Section; and last September he was elected president. He will preside over this year's meeting of the Association, which will be held in South Africa.

German Exports of Ammonium Chloride

EXPORTS of German ammonium chloride (35,580 metric tons) were nearly 40 per cent. greater in 1928 than in 1927. This reflects to some extent the German efforts in various foreign markets to popularise ammonium chloride as a fertiliser to replace ammonium sulphate. The largest markets for this trade were Belgium (10,012 metric tons), France (9,996), Netherlands (3,689), United States (3,509). Other countries purchasing smaller quantities were Great Britain (1,906), Japan (1,846), Argentina (571), and Canada (549).

Dead Sea Salts Concession

Terms of Agreement

A WHITE PAPER [Cmd. 3326] was issued on Wednesday, giving the terms of the draft agreement and concession between the Crown Agents for the Colonies, acting for the Governments of Palestine and Transjordan, and Major Tulloch and Mr. Novomeysky regarding the concession for the extraction of minerals from the Dead Sea.

It is provided that within 12 months from the date of the signing of the agreement the applicants for the concession are to form a company with a capital of not less than £100,000, and, further, that "not less than one-half of any capital or debentures of the company in excess of a total of £250,000 shall be offered for public subscription, and Palestinian citizens and Transjordanian nationals shall have a prior right to the allotment of not less than one-fifth of such public issue." A period of 12 months is allowed for the agreement to be carried out, and all disputes under it are to be submitted to arbitration.

The Lease

The concession is the lease at a nominal rent of four square kilometres of land for evaporation purposes abutting upon the north-western end of the Dead Sea, and further land actually required for auxiliary works. The term of the concession is for 75 years. The concessionnaires are to have the exclusive rights for 25 years to extract mineral salts from the Dead Sea, and at the end of that period they will have the first option on any proposed further concession.

The company will be required to produce the following minimum quantities of potassium chloride of 80 per cent. purity:—During third year of concession, 1,000 tons; during fourth year, 1,500 tons; during fifth year (provided that the metal road between the Dead Sea and Jerusalem is completed), 3,500 tons; during sixth and seventh years, 5,000 tons per annum; during eighth to tenth years, 10,000 tons per annum; during each subsequent year, 50,000 tons. A royalty of 5 per cent. of value in bulk at works on the potassium chloride, bromine and magnesium chloride produced has to be paid by the company.

Disposal of Profits

After the payment of 10 per cent. on the sum approved by the Government, the remaining profits are to be shared by the Government in the proportion of 20 per cent. to the Government and 80 per cent. to the company on the next 5 per cent., and 40 per cent. to the Government and 60 per cent. to the company on any further profits. Any sums standing to the credit of the reserve fund at the end or determination of the concession shall belong to the Government and the company in the proportion of 40 and 60 per cent. respectively. The Government reserves the right to subscribe capital or to convert its interests into shares. [The term "Government" means the Governments of Palestine and Trans-Jordan jointly.]

"The company," the draft concession adds, "shall not be entitled to gold, silver or other precious metals and their ores, precious stones, antiquities or mineral oil, whether on or beneath the shores or under the waters of the Dead Sea, or under or upon any lands in the occupation of the company. The company shall give the Government immediate notice of any such discovered, and the Government shall have the right to get the same on payment of fair compensation for any surface damage. The Government to have the right to enter upon any lands for the purpose of exploring for and obtaining any such discovered subject to payment of compensation for any damage, etc."

Terms regarding the construction of roads and railways are also included.

Electrothermal Production of Phosphorus

LARGE-SCALE production of phosphorus is expected to reach 100 tons daily at the Piesteritz cyanamide works, Germany, where three giant closed three-phase furnaces are used. The crushed rock mixed with quartz and coal are fused, and the volatilised phosphorus converted into acid. The power consumption has been reduced from 11-13 kilowatt-hours to 9 kilowatt-hours per kilo. of phosphorus. German phosphorus production (estimated by Dr. Johannes Hess, Munich) is 30,000 metric tons, compared to world production estimates, by the same authority, of 33,000 metric tons.

Society of Public Analysts

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on Wednesday, May 1, the president, Mr. Edward Hinks, being in the chair.

Certificates were read for the first time in favour of:—J. W. H. Johnson, Mamie Olliver, and G. E. Shaw. Certificates were read for the second time in favour of:—A. N. Leather, R. H. Morgan, and W. G. Painton. The following were elected members of the Society:—P. T. Clarke, A. C. James, H. Lee, J. F. Morse, L. J. Odling, and W. H. Wilkinson.

Determination of Organic Peroxides

A paper on "The Determination of Organic Peroxides" was read by Dr. R. S. Morrell and S. Marks. Fahrion's method of determining the peroxide oxygen in oxidised linseed oil, by measuring the iodine liberated from potassium iodide in the presence of sulphuric acid, has been studied by means of pure benzoyl peroxide and other peroxides. The effect of varying the conditions has been investigated, and a modified method has been devised, which gives concordant results with oxidised vegetable oils and their decomposition products.

Halogen Absorption of Oils and Fats

Mr. J. W. Croxford dealt with the "Differential Halogen Absorption of Oils and Fats." Toms's bromine vapour method of determining the halogen absorption of oils gives rapidly the true iodine value of certain oils and fatty acids which require very many hours for complete absorption of the Wijs reagent. Fatty acids and oils of the oleic acid series, with the double bond adjoining the carboxyl group, *e.g.*, crotonic acid, tiglic acid and croton oil, may thus be recognised by the difference in the results obtained by the two absorption methods. On the other hand, the iso-oleic acids formed in the hydrogenation of oils, and the petroselinic acid of parsley seed oil, give similar results by the two methods, and have thus the double bond at a distance from the carboxyl group.

Separation of Tantalum and Niobium from Titanium

"A New Method for the Separation of Small Quantities of Tantalum and Niobium from Titanium" was discussed by Dr. W. R. Schoeller and C. Jahn. The solution containing the oxalates is treated with sodium salicylate, which converts the titania into a stable crystalloidal sodium titanylsalicylate. The earth acids are then precipitated with calcium chloride, the precipitate dissolved in hydrochloric acid, oxalic acid destroyed with permanganate, and the earth acids precipitated with tannin. After repetition of the process, very little of the earth acids escapes precipitation, and an empirical correction is made for this. Finally the earth acids are converted into pentoxides, which are practically free from titania.

Analysing Small Gas Samples

Mr. H. R. Ambler contributed a paper on "The Analysis of Small Samples of Gas." Apparatus for the analysis of small samples of about 1 c.c. of gas was described, in which rubber connections were abolished. The volume of absorbent reagent was reduced, and the sensitiveness of reading increased. Typical analyses with the use of this apparatus were described.

Scottish Smokeless Fuel Innovation

SMOKELESS fuel—guaranteed, like the gas supply, to produce a fixed maximum of heat units per ton, and to contain a minimum of ash content—will be placed on the market early this summer, when the world's biggest low-temperature coal distillation plant, being erected for the Bussey Co. at Glenboig, near Glasgow, is in operation. This innovation has been made possible as a result of special research on Scottish coals carried out by Dr. H. B. Cronshaw, the company's consulting chemist, in London. The new plant will produce over 400 tons of fuel daily. "Buying coal has been more or less a gamble to the public up to now," states Dr. H. B. Cronshaw in an interview. "With few exceptions one can never guess what the next ton—or bag for that matter—will be like. It may burn brightly, give intense heat, and leave little ash; on the other hand, it may be everything that coal should not be. Our new scheme will obviate this entirely. The housewife will know exactly what she is buying."

Merchandise Marks for Glassware

Continuation of Inquiry

THE Committee appointed by the Board of Trade, under Part II of the Merchandise Marks Act, which is inquiring into the application of the glassware manufacturers for an Order requiring that imported glassware should bear an indication of origin, continued its proceedings on Tuesday, May 7. The earlier proceedings were reported last week (p. 425).

Mr. Wethered (counsel for the applicants) read a resolution which was passed on November 25, 1928, by the Pressed Glass Makers' Society (a body whose membership comprised the skilled workers in the industry) in support of the application.

Evidence Against the Application

Mr. B. S. Straus (chairman of Virol, Ltd., who also had authority to represent Bovril, Ltd.), gave evidence against the application. Both the companies mentioned, he said, were very large users of glass containers for the packing of food products, and Virol, Ltd., had used British bottles exclusively, except for a period during the war, when they had been unable to obtain British-made bottles and had obtained supplies from the United States. It was quite possible that, as the result of strikes and hold-ups in the glass industry in this country, they might at any time be compelled to pack their products in bottles of foreign origin, and it would be exceedingly prejudicial to their business if they were compelled to send out their products in bottles bearing a mark of foreign origin. Such marking of the containers would suggest to many people that the contents were also foreign, and would greatly prejudice the goodwill of the British-made article. It would also create prejudice in the Dominions, where the necessity for the use of such bottles might not be understood.

The glass bottles which had been obtained from the United States during the war were excellent; he believed it was the best glass his company had ever had, and the wastage was infinitely small. There had been an enormous number of throw-outs of English bottles when they were first used, but he was glad to say that the number had since been very much reduced. As to price, taking all charges into consideration, there was very little difference between the foreign and British.

Mr. Wethered pointed out that Virol, Ltd., and Bovril, Ltd., had a reputation for supplying British goods, and that if they supplied those goods in foreign bottles which were not marked, and did not want the public to know the bottles were foreign, they were misleading the public.

Mr. Straus replied that they did not wish to mislead. Not only would the marking affect the trade, but the making of an order requiring foreign bottles to be marked would lead the British bottle manufacturers to increase their prices.

Mr. Wethered said that there was a great deal of competition between British manufacturers. Mr. Straus replied that probably there were also working agreements. Mr. Wethered said he was informed that there were no working agreements between the manufacturers.

Fancy Glassware

Major J. H. B. Wigginton (a director of some of the associated companies of Lever Bros., Ltd.), gave evidence against the application, and said he had been nominated to do so by the managing director of Lever Bros., Ltd. The associated companies manufactured soaps and perfumes and kindred articles for home and export trade, and had all definitely recorded the view that the proposed compulsory branding of imported containers was undesirable. They were substantial users of glass containers, certain types of which they purchased from British glass factories, whose products were satisfactory; but other types they could not obtain in this country. In 1920 or 1921 he had offered a certain British manufacturer financial assistance to produce a certain type of perfume bottle, the figure of £20,000 being mentioned in this connection, but the manufacturer concerned had stated definitely that it was impossible to make it in this country.

The Chairman (Sir Hubert Llewellyn Smith) asked if it were technically or commercially impossible to make it.

Major Wigginton said it was technically impossible. His recollection was that there were neither the machinery nor the workmen in this country to make the bottles.

Mr. Wethered (cross-examining) asked witness if he had approached more than the one firm with a view to getting the perfume bottle made.

Major Wigginton said he did not think so, but at the time the firm that was approached was considered to be the best firm of manufacturers of bottles of that type in the kingdom. His company were anxious to use British bottles where possible, and did in fact use large quantities of them.

The proceedings were adjourned until Monday, May 13.

Survey of River Tees

THE Tees Conservancy Commission will co-operate with the Department of Scientific and Industrial Research in the proposed hydrographical and chemical survey of the river Tees. The Government is prepared to undertake the work for one year at its own expense. The objects of the survey are to gain scientific knowledge of the natural behaviour of a typical river in an industrial area, to discover how it counteracts the effects of pollution, to determine its capacity for self-purification, and to ascertain the conditions which help or hinder the natural process tending to bring about this purification. A letter from the Department was received by the Tees Conservancy Commission, intimating that a committee had been appointed, comprising Professor G. C. Bourne (chairman), Dr. F. J. Allen, Professor V. H. Blackman, Dr. H. T. Calvert (Director of Water Pollution Research), Rear-Admiral H. B. Douglas, Dr. E. S. Russell, Dr. R. Slade, and Mr. H. E. Wright. The Department regarded as essential the co-operation of all interests on Tees-side if the survey was to yield results of the greatest scientific value and to be of maximum benefit. They were of opinion that it could best be secured through the medium of a consultative committee, on which the various interests of Tees-side would be represented, and it had been, therefore, decided to set up such a committee. Alderman F. T. Nattress was appointed by the Commissioners as their representative on the committee, and it was reported that Mr. J. H. Amos, general manager of the Commission, had been asked by the Department to act as chairman. The first meeting of the consultative committee is to be held at Middlesbrough on June 7.

Chromium-Plated Laboratory Weights

THE hardness of chromium plating is a considerable advantage in the case of weights that are much used, but this advantage is somewhat offset by the susceptibility of such a coating to attack by fumes of hydrochloric acid. The United States Bureau of Standards has tried this plating on three sets of weights which have been put into use in the chemistry division. In preparing these sets it was found that great care is needed in washing the plating liquid out from under the knob. If this is not done the weights vary with changes in atmospheric humidity, as is the case with gold-plated weights. Some indication of the degree of care needed was given by the fact that one of the three sets was at first too variable to warrant regular certification, although a careful laboratory assistant, familiar with electroplating work, thought that he had washed this set thoroughly, and just as carefully as the other two sets. As in the case of gold-plated sets, it was found that this chromium plated set could readily be made constant by proper boiling and rinsing.

The Newest Benn Books

AMONG books announced for early publication by Ernest Benn, Ltd., are the following:—*The Splendid Adventure*, by the Rt. Hon. W. M. Hughes (21s.), a review of Empire relations within and without the Commonwealth of Britannic nations, by the former Prime Minister of Australia; *The Embezzlers*, by Valentine Kataev (translated by L. Zarine) (7s. 6d.), the first significant novel to come out of Russia since the Revolution; *Drought*, by Jan Van Avond (6s.), a terrible picture of a South African drought; *A New Era for British Railways*, by Howard C. Kidd (7s. 6d.), a study of the Railways Act, 1921, with special reference to amalgamation; and *British Farm Crops*, by A. W. Oldershaw and J. Porter (12s. 6d.), science and farm practice in combination.

Patent Law Reform

[From a Correspondent.]

In the following, a correspondent makes a number of suggestions with regard to the reform of the Patent law, with particular reference to chemical matters.

Various recommendations have been made for the reform of the British Patent system, but strangely enough chemical inventions do not appear to have received consideration adequately commensurate with the prominent position which chemistry in all its various branches to-day occupies in the industry of this country. The fact that there is an ever-increasing number of applications filed at H.M. Patent Office in respect of chemical inventions renders it desirable to record the following further suggestions whereby the Patents and Designs Acts might be amended in order to improve the status of British chemical patents.

(1) *Section* 38 *A*, which deals with chemical products and substances intended for food or medicine, does not appear to have received any consideration, yet it has a very considerable importance to chemists. The Section is worded in such an ambiguous manner that its interpretation has involved considerable and quite unnecessary expense to applicants for patents.

The basis upon which the Section was founded was well conceived and of advantage and acceptable to chemists so far as products resulting from chemical proceses were concerned, but in its present form it is hopeless. The Section should be subdivided into two sections, the first dealing with inventions relating to substances prepared or produced by chemical processes and the second with inventions relating to substances intended for food or medicine. The first section would not appear to require any material changes in its wording except perhaps that the word "special," which occurs in the section, and has been the subject of much controversy, might be replaced by the word "particular." The second section should be completely revised to make it quite clear that patents will not be granted for mere prescriptions, formulæ, mixtures or recipes for foods or medicines, or that patents will not be granted for *any* inventions relating to substances, *i.e.*, products intended for food or medicine, at all. The second section might with advantage be extended to cover any of the vital necessities of life. If the present section is amended chemists will at least know definitely what they are precluded from patenting.

(2) *Section* 11, which deals with opposition to the grant of a patent, and *Section* 26, which concerns the revocation of a patent before the Comptroller, or what is frequently termed "Belated Opposition Proceedings," might be amplified by including all the grounds which can be relied on in a petition to the Court for the revocation of a patent under *Section* 25. Such amendment would empower the Comptroller to refuse mere "Paper Patents" or so-called "Blocking Patents" or even what may be called "Re-Patenting Patents" for alleged inventions relating to chemical matters, while the high costs of proceedings in the Courts would be avoided.

At the present time it is extremely difficult to obtain the refusal of such patents as those referred to above in proceedings before the Comptroller, and generally speaking, the only result that can be obtained is that the specifications opposed are improved and patents, which if ever brought before the Courts would almost certainly be declared invalid on one or more grounds, are sealed, only to be an obstacle in the way of further development in the particular branch of chemical industry to which the patent relates.

(3) *Section* 26 might be amended so that "Belated Opposition Proceedings" could be brought within two years of the date of grant. At the present time the two years commences from the date claimed for the patent, and in the case of applications coming from abroad the two years period has generally expired before the application is even accepted.

(4) *Section* 7. The suggestion has been made that examiners should be empowered to cite any publications other than British specifications of which they are aware. The proposal is quite sound and should be adopted because it can only improve the status of chemical patents.

Before any changes are made in the Patents Acts it is to be hoped that the views of the chemical profession as a whole will be ascertained.

H. D. E.

River Pollution Action

Judgment in Favour of Chemical Firm

The Chester magistrates on Saturday dismissed the case brought at the instance of the Chester Waterworks Co., against the Graesser Monsanto Chemical Co., Ltd., of Acrefair, for causing unclean water belonging to them or under their control to run into the waterworks belonging to the Waterworks Co., whereby the water was fouled. Mr. W. F. Youde, of Chester, appeared for the Waterworks Co., and Mr. Austin Jones for the defendant company.

Opening the defence, Mr. Austin Jones said that the dates of the case were very important. The charges were that on five days—February 26 and 27, March 22 and 23, and April 23—the defendants caused filthy water to run into the waterworks. The part of the waterworks in question was a thousand yards round about the intake, and what the prosecution had to prove was that the defendants caused filthy water to run into that stretch of 1,000 yards. There was no analytical evidence that anything discharged from the defendants' works ever found its way into that stretch of 1,000 yards. There were other causes from which the carbolic taste of the water might have arisen, such as underground works, sewers, disinfectants, and tar from roads. The amount of tar acid taken in the sample of February 27 was infinitesimal. The last sample was taken on April 22, but there was no suggestion that in that month there was anything wrong with the water in Chester.

Counsel said he would call evidence to show that a sample was taken at the mouth of the brook on April 22, and that the water contained fewer than two parts in a million of tar acid. The question of the mortality of the fish was brought in to make weight in the case, but no fish died after March 1. It was alleged that the fish in February were killed by some effluent from the defendants' works, but there was no evidence that any fish were killed in March or April. That showed how dangerous it was to come to a hasty conclusion in a case of that nature. There was no evidence at all that the Dee was contaminated with tar acid; neither was there evidence that the fish were contaminated. A certain amount of tar acid would have to escape from any stream flowing in such a works anywhere in the country, and if firms were to be prosecuted in that manner, the crippling of industry would be greater than anyone could imagine.

Dr. William Herbert Garrett, employed by the chemical company, said that on investigation of the quantity of tar acid in the water it was found that it would be quickly diluted, and it would be impossible to taste it in the water. It would, in fact, be diluted to one part in 90,000,000.

Mr. Bower, Associate Member of the Institute of Civil Engineers, and technical director at the works, said that samples were taken and analysed each day. He had no hesitation in saying that by the time the liquid which the prosecution had said was trickling into the brook got into the stream and was carried down to the river, the pollution would not be greater than one part in 1,000,000.

The chairman of the Bench (Mr. W. H. Denson), after a retirement of the magistrates, said that after considering all the evidence, they were quite of the opinion that the prosecution had not made out their case. Therefore the summons was dismissed.

Japanese Drug and Medicinal Exports for 1928

Chemicals, drugs and medicines exported from Japan during 1928 amounted to approximately 21,000,000 yen, according to the Ministry of Finance. The largest item, pyrethrum, or insect powder, was valued at 7,487,675 yen, doubling that for 1927. Next came camphor, totalling 5,447,522 yen, a decrease of 190,210 yen on the previous year. The export value of the leading articles during 1928 was as follows:—

	Yen.
Camphor Oil	1,003,019
Peppermint Oil	2,075,890
Ginseng	251,519
Pyrethrum	7,487,675
Camphor	5,447,522
Menthol, Crystal	3,914,516
Menthol	178,680
Iodine	412,670

Changing Conditions in Industry

Sir Max Muspratt at Widnes

SIR MAX MUSPRATT visited Widnes for the first time since the death of his son, Mr. Rudolph Muspratt, on the occasion of Industrial Sunday, and delivered the principal address. The Mayor (Councillor Hardman) alluded to the great sorrow that had fallen on Sir Max and Lady Muspratt, and tendered to them and to their daughter-in-law the sincere sympathy of Widnes people. They rejoiced that twin boys had been born to Sir Max's daughter-in-law, and hoped that they would grow to manhood and continue the Muspratt connection with Widnes.

Sir Max, who was deeply touched, remarked: "Rudolph would, I venture to say, have carried on the great traditions. His generation is now cut out, and although it is a great happiness that we have these two lusty twins they cannot be ready for work for another generation at least." In the past the Muspratt family had accepted good or bad times without complaint.

Widnes, he proceeded, had been extraordinarily free from industrial trouble because of the display of human sympathy. The chemical industry was a scientific industry, and all connected with it—masters and men, as the old term was—or colleagues as they were now—thought of the various problems and tried to solve them. The greatest science in the world was a knowledge of humanity, and the use of that science was one of the great secrets why Widnes and the chemical industry as a whole had been so free from strife. Knowledge and understanding were wanted in this country to-day and the other industrial benefits would follow.

"I don't pretend to say," he added, "that everything has been right at all times in Widnes. There were bad old conditions which had to be reformed and improved and were still being reformed and improved. There were financial difficulties in the past in the bad times, the very hard times of 20 and 30 years ago which made it impossible for the younger generation to do what they wanted to do. But the moment the opportunity arose we did try to do our duty to the manual workers and the clerical workers in the United Alkali Co., and I venture to say that anyone who has grown up with Dr. Clayton and myself will realise that we established an entirely new atmosphere in the relationship of employers and employed in Widnes."

Position In Other Industries

Dealing with other industries, Sir Max said that the touch of human sympathy had not been so apparent. The folly of strife was observed, and there had never been a strike or a lockout during the last 25 years which had benefited anyone. Since the war five big industries, owing to want of understanding, had upset every one of the others, and those who had industrial peace at heart were slowly trying to recover from that. The experience gained from the general strike and the coal stoppage had resulted in a different mind, and the Mond-Turner Conference had undoubtedly created an atmosphere which augured well for the settlement of industrial matters generally.

On the question of efficiency, Sir Max said they had to keep up export trade by competitive prices which could be obtained in the old bad way of reducing wages or in the sounder method of bringing to bear the greatest scientific efficiency in producing the goods. By that method they could pay higher wages and reduce the cost of living for everyone in the country. Greater efficiency in machinery meant more work for the engineers, while the machines were being put up, but less men employed afterwards. How to bridge that gap was the cause of the nation's anxiety. He suggested that everyone should put the best brains into solving that problem.

Manufacture of Fertilisers in British Columbia

THE Consolidated Mining and Smelting Co. of Canada, Ltd., in its annual report, just issued, intimates that experiments made last year on prairie farms in the use of triple superphosphate from the Trail smelter proved satisfactory. With the completion of the first unit of the contact sulphuric acid plant, production on a commercial scale of acid phosphate will be begun. Consideration has been given to the production of sulphate of ammonia. It is likely, therefore, that in the future the company will be a large producer of synthetic fertilisers.

The Chemical Future of Widnes

Long Service Awards to Chemical Workers

THE presentation of watches and medals for long service to workers in the employ of the United Alkali Co. at Widnes was attended by Dr. G. C. Clayton, M.P., Captain F. W. Bain, and others.

Mr. R. H. Davidson (who presided in the absence of Mr. J. H. Smith, whose health had broken down), referring to the future of the works, said that if the United Alkali Co. had continued its control instead of I.C.I., it would have made no difference. Certain processes were found impossible for Widnes. For years past for similar reasons, St. Helens had been gradually closing down; and on the Tyne the same thing had happened. In the olden times these changes came more slowly, but the war upset the balance, and these changes could not be helped. Sir Max and Dr. Clayton had done their best to make them as easy as possible, and the directors had given anxious consideration to the men. "I know," he said, "that these things are a very great worry to Dr. Clayton, but you know as well as I do that he would not mind the worry if it results in any good, and I think Dr. Clayton's efforts will bear some fruit."

Dr. Clayton, in the course of his speech, said that it was a very great honour to give long service awards to men who had served faithfully, and he was extremely proud to wear the medal and watch presented to him last year for 32 years' service in the U.A. Co. During these 32 years he had made many friends in the works. Dr. Clayton then distributed a number of watches and medals.

Mr. Lloyd Roberts said that the U.A. Co. had again topped the bill for the whole of the I.C.I. Referring to the absence of Sir Max Muspratt, he tendered to Sir Max, Lady Muspratt and Mrs. Rudolph Muspratt their sincere sympathy. "We are all delighted," he said, "to see the third generation of Max and Rudolph come into the world, and wish them joy and happiness." It had been decided to present to all who had put in a half century or more of service a very handsome clock, in addition to the awards they already had, but those could not be given just yet because it meant making over 200 clocks for the whole of the I.C.I.

Acknowledging a vote of thanks to the chairman and directors on behalf of the workers, Captain Bain said that he was voicing the opinion of everybody in I.C.I. administration in London, in giving their thanks to Widnes men for many years of loyal service. He was pleased and proud to come back to Widnes, which for 100 years had been the hub of the chemical universe, and which he felt confident would continue for another 100 years to add to its great traditions.

Replying to a personal vote of thanks, Dr. Clayton said he had thoroughly enjoyed meeting so many old friends and he hoped that he would remain a friend of theirs. On behalf of the directors of I.C.I. he expressed appreciation of the excellent work that was being done by the men in the chemical trade. "I shall go back to London and I shall press upon the directors that they must not waste the valuable material they have in Widnes. I hardly need to say it to them because I have a promise from the directors of I.C.I. that any new processes that can equally well be worked in Widnes shall be worked in Widnes. Sir Max Muspratt and I will lose no opportunity of pressing it upon the other members of the Board. I am delighted to be here to-night and shall go back encouraged to do what I can for Widnes."

Lithium in Canada

LITHIUM occurs in spodumene ore and also to a considerable extent in lepidolite with some amblygonite between the Winnipeg and Oiscau Rivers, east of Winnipeg. The deposits appear to be substantial, one of them being estimated to contain 30,000 to 40,000 long tons. Production so far has been experimental only, 60 tons having been produced in 1927 and about an equal amount in 1928. Two carloads were shipped to a glass company in the United States in 1927, and experimental shipments were sent to England. The demand for lithium from the glass, battery, and other trades has not been sufficiently great to cause development of these deposits in a large way. They are located near a large hydroelectric development at Points du Bois, and cheap power would be available for the extraction of lithium if demand for it should develop sufficiently.

? A Correction Needed

To the Editor of THE CHEMICAL AGE.

SIR,—I am startled, indeed rather shocked, by the veiled levity of the closing sentence (accentuated by the caveat in brackets) in your reference to the coming Manchester meetings. I venture to urge that, being so well known in the States, and knowing them so well, you will take Uesanians seriously (even though themselves they at times fail to do so) and impress upon the Apostles of Liberty and Equality who will visit us how earnestly we desire, both in our prayers and in public, to rate them at the osmotic level and hydrionic concentration which their nation would impose upon itself. The opportunity is one for us to mend our wicked ways. The Society of Chemical Industry should sure arrange with the Clerk of the Weather and the local licensing authority that Cottonopolis be Lit(tl)erally dry during the full week of the meeting. Let there be no *p*H about it—only deep draughts of Thirlmere's soft hydronic entire (now free from all *p* taint of Wythburn Inn) should be allowed. All male poultry caudal appendages should be banished to distant fields, for the time being—we may hope there will then be grass within sight. The President-nominate, who will receive in his garden, has already seen to it that, on his lawn, the game birds are petrified, thus setting an example in safeguarding the observance of the rites of hospitality. He will also discountenance tobacco with meals, so that the delicacy of Thirlmere's vintage may not be dissipated. It is for us to show that, even in this season, and groaning as we are under an intolerable Beer Tax, we can so appreciate dryness as to maintain it for our friends. Also let there be a ban on mourning dress in the evening, if only by way of example to the " Infant Mixed."—Yours, etc.,

$P_2 O_5$.

Sulphur in Flue Gases

An American Investigation

IT is well known that in the burning of coal the larger part of its sulphur content passes out with the flue gases, and only a small percentage is found in the ashes and clinker. The determination of the sulphur content of flue gases involves difficulties both in the sampling and in the chemical technique.

An investigation has been made at the Pittsburg Experiment Station of the United States Bureau of Mines, Department of Commerce, on Pittsburg coal burned in the furnace of a small power boiler. Measurements were made for 8-hour periods of the total sulphur in the refuse, in the gases beyond the bridge wall, and in the flue gases, in the attempt to account for the total sulphur in the coal. With the greatest care the total sulphur as measured always averaged less than that in the coal. From 3·2 to 4 per cent. of the total sulphur was found in the refuse; from 82·2 to 93·3 per cent. in the gases at the bridge wall; and from 75·4 to 83·4 per cent. in the flue gases. Thus at the bridge wall the percentage of sulphur unaccounted for ran from 3·5 to 13·8 per cent., while in the stack there was missing from 12·6 to 21·4 per cent.

The investigation showed that great care must be taken in the sampling and in the analytical technique, or the sulphur so measured may be much too low. This investigation did not determine the form in which the sulphur existed in the gases or in the refuse.

Humphry Davy Celebrations in Cornwall

CORNWALL is preparing to celebrate the centenary of the death of one of its most distinguished sons, Sir Humphry Davy, the eminent chemist. He was born at Penzance, where, on May 28, the three learned societies of Cornwall, the Royal Institution, the Royal Geological Society and the Royal Polytechnic, are meeting to do honour to his memory. A laurel wreath will be ceremonially placed on the Davy monument by Mr. J. C. Tregarthen, president of the Royal Institution of Cornwall, in the presence of Sir Humphry Davy Rolleston, a lineal descendant of the great chemist, and commemorative addresses will be given by Professor Ambrose Fleming, representing the Royal Institution of Great Britain, Dr. John Symons, president of the Royal Cornwall Geological Society, and others. There will also be an exhibition of Davy relics.

Chemical Notes from Westminster

Questions in the House

The Gallery, Westminster.

IN the House of Lords (May 7) in Committee on the Reconstituted Cream Bill, objection was raised to the term " reconstituted " cream. This word, it was felt, was not an accurate description of the article, and an amendment was therefore moved by Lord Clinton to substitute " artificial " in its place. A number of other names were suggested, including " man - factured," " imitation," " milkreme," and the spelling of " kream." The Marquis of Salisbury, ins upporting the use of the word " artificial," stated that this term put before cream would convince everybody it was not cream. The amendment was carried and the title was accordingly altered to the " Artificial Cream Bill."

In the House of Commons (May 6), Sir P. Cunliffe-Lister (Board of Trade) said that there had been various inquiries at the Board by committees into different sections of commercial law, in order that, after the fullest authoritative information had been obtained, the law might be brought up to date in the light of the best business and legal experience. One field of commercial law which had not been covered was patent law and practice. He was satisfied that the time was now ripe for full and thorough consideration of that subject, and he proposed to appoint a committee to inquire into it. Sir Charles Sargant, who had had a wide experience on the bench and as chairman of the Committee of Awards and Inventions in connection with the war, was prepared to take the chair of the committee.

New Australian Fertiliser Company

A NEW company, known as Victor Leggo and Farmers, Ltd., has been formed in Australia to acquire the business of Victor Leggo Chemical Co. Pty. (Ltd.), with works at Yarraville, Victoria. This company is one of the best known manufacturing and importing Australian chemical companies. This concern seeks to connect the interests of the manufacturer of fertilisers with those of the farmer. Shares in the company will be sold to the farmer customers, and it is thought that business will, in this way, be increased and stabilised. Customer shareholders, in addition to receiving a yearly dividend on their shares, will also receive yearly a bonus or rebate. The company intends to erect a new modern fertiliser plant. It expects to be able to manufacture sulphuric acid from Australian sulphide ore. Although the demand for fertilisers in Australia is on the increase, competition is very keen.

Additions to Nauru Phosphates Plant

ADDITIONS and extensions are being made to the phosphates plant at Nauru and Ocean Island to permit a further increase of output in the near future. According to the annual report of the British Phosphates Commission, the total output for the year ended June 30, 1928, was 501,908 tons, of which 377,456 tons, or 75·20 per cent., were shipped to Australia, and the remainder to New Zealand. The production showed a reduction of 93,000 tons on the previous year. In addition, the commissioners purchased and distributed in Australia 104,917 tons. Sales of phosphate amounted to £666,991, and the f.o.b. cost of £659,122 included £224,053 for interest at 6 per cent. upon the purchase price paid for the business by the British, Australian and New Zealand Governments, and a contribution towards a sinking fund for the redemption of capital in 50 years.

Indian Imports of Artificial Silk

INDIAN imports of artificial silk yarn, which have been continuously on the increase until lately, showed a fall during 1928 from Rs. 160 to Rs. 133 lakhs. This was principally due to the stoppage of Bombay cotton mills owing to the general strike for five months of the year. These mills use a large quantity of artificial silk yarn. Imports from the United Kingdom fell from 2·2 to 1·7 million lb., and those from Italy from 4·5 to 2·8 million lb. The imports of artificial silk and cotton piecegoods rose from 44 million yards to 58 million yards. The United Kingdom and Italy both increased their shares.

From Week to Week

SEVERE DAMAGE was caused by fire on May 4 to the premises of the Welsbach Light Co., Ltd. at Birmingham.

SIR ROBERT ROBERTSON, the Government Chemist, has been nominated as vice-president of the Royal Institution, of which he is already treasurer.

THE FORD MOTOR CO. (of America) produced in 1928, among its by-products, ammonium sulphate valued at $814,259, as compared with $703,412 in 1927.

RECENT DONATIONS to the National Radium Fund include £500 from Mr. and Mrs. Robert Mond; 50 guineas from May and Baker, Ltd.; £100 from Lucy Lady Brunner.

THE FRENCH URBAIN COMPANY (Charbons Actifs et Procédés Urbains) has commenced the manufacture of phosphoric acid and ammonium phosphate at its works at Givors.

THE ATMOSPHERIC NITROGEN CORPORATION intends to commence the construction of one section of a new unit for its plant at Hopewell, Virginia, U.S.A. The first unit was completed early this year.

APPLICATIONS FOR GRANTS from the Chemical Society Research Fund must be made on forms which can be obtained from the Assistant Secretary. Details will be found in our advertisement columns, p. xxix.

THE PORTRAIT of a former Duchess of Sutherland, which Mr. Arthur L. Nicholson, the London art dealer, believes to be a Romney, is to be examined by Professor A. P. Laurie, of Edinburgh, the official chemist to the Royal Academy.

THE WIGTON PLANT of the British Netherlands Artificial Silk Co. is to have twice the capacity originally intended in the prospectus, i.e., twenty tons instead of ten tons per week. The Derby site will be reserved for future developments.

LONG-SERVICE AWARDS were made to I.C.I. employees at Raynes Quarries, near Colwyn Bay, on Tuesday. Gold watches were given to four men with over thirty-five years' service and silver watches to ten men with over twenty-five years' service.

IN THE ARTICLE on "Research and Analytical Chemicals" which appeared on p. 398 of the issue of THE CHEMICAL AGE dated April 27, the name of the firm mentioned should have read Hopkin and Williams, Ltd., and not (as it appeared owing to a printer's error) Lopkin and Williams, Ltd.

THE BROMINE recovered in 1928 by United States producers from natural brine, and the bromine content of bitterns used by producers in the manufacture of bromine compounds, was 2,164,000 lb., valued at $649,475, an increase of 23 per cent. in quantity and 15 per cent. in value on the 1927 figures.

MAJOR-GENERAL AMOS A. FRIES, the founder and for some years past chief of the United States Chemical Warfare Service, has retired from that position and has been succeeded by Major-General H. L. Gilchrist, who has been associated on the medical and research sides with the Chemical Warfare Service for a period of ten years.

THE HANBURY MEDAL of the Pharmaceutical Society of Great Britain has been awarded to Professor H. H. Rusby, head of the department of materia medica in the College of Pharmacy, Columbia University, New York. The medal is awarded "for high excellence in the prosecution or promotion of original research in the natural history and chemistry of drugs."

A FIRE broke out on Tuesday at the works of the Oaks Chemical Co., Ltd., at Stairfoot, near Barnsley. Workmen and others, working under the direction of Mr. W. Deacon, the works manager, were able to check the blaze. By the time the Barnsley Fire Brigade arrived they had it in hand, and assisted the firemen to extinguish blazing tar and the furnaces under the naphthalene stills.

A PROVISIONAL AGREEMENT has been made by the Tarapacá and Tocopilla Nitrate Co. with the Grace Nitrate Co. for the acquisition from the latter of 19,154,490 square metres of nitrate grounds. The purchase price is 977,000 fully-paid 10s. shares of the Tarapacá Co., and a resolution will be put forward at the meeting of the latter company on May 13 to increase the capital to £1,000,000 by the creation of 1,200,000 new 10s. shares.

BY INVITATION of the directors of the Stanton Ironworks, a party organised by the Nottingham Section of the Society of Chemical Industry visited the works at Stanton on the afternoon of Thursday, May 2. They were first shown the cupola furnaces, which are largely automatic and supply charges of remelted pig to the adjoining spun iron pipe section. This process was illustrated by fractures of the chill cast pipes and photomicrographs of the same and after normalising. In the laboratories were also displayed machines for testing the hardness of the tar coating on pipes, the quality of cement used in the spun concrete pipes, etc. The party then inspected the back of the new blast furnaces with their completely mechanised feeding machinery, and in contrast later the display of traditional human skill in the tapping. The interest and thanks of the party were expressed at tea by the chairman, Dr. F. L. Pyman.

THE PRODUCTION OF CHLORATES in France is estimated at 10,000 metric tons annually, all of which is consumed in France and the French colonies.

BRITISH INTERESTS are said to be acquiring important Italian asbestos deposits, containing many millions of tons of high-grade long-fibre material.

TWO DIRECTORS of the German potash syndicate, Dr. Karau and Professor Eckstein, have visited Russia in order to inspect the potash deposits at Solikamsk.

THE NEW WORKS of North British Artificial Silk are now practically ready for starting production, and plant tests are now in progress. The opening date has been fixed for June 1.

THE RATIONAL CARBONISATION SYNDICATE gave a demonstration on Tuesday, at Slough, of the working of the coal distillation process worked out and patented by the late Dr. Paul Dvorkovitz.

THE SUBJECT selected for the Sir Edward Frankland Medal and prize (£10 10s.) for registered students of the Institute of Chemistry is "The Cultural Value of Science." The award will be made in January, 1930.

THE FINANCE CO. of Great Britain and America, Ltd., announced on Tuesday that the new issue of Imperial Chemical Industries, Ltd., had been very largely over-subscribed, both for preference and ordinary shares.

TITANIUM WHITE is to be produced on a commercial basis by the Radium and Rare Earths Treatment Co., of Australia. Production is to commence in the near future, and an agreement has been made with the Tarsene Co. to sell the entire output.

THE APPLICATION OF SPECTROSCOPY to the examination of foods is described in a pamphlet entitled "Spectroscopy in Control of Purity in Foodstuffs," published by Adam Hilger, Ltd., of 24, Rochester Place, Camden Road, London, N.W.1.

THE DISCOVERY OF DEFRUCTOSEANHYDRIDE, a new sugar, is announced by the United States Bureau of Standards. In attempts to hydrolyse inulin to fructose by treatment with acid it was found that only 92 per cent. hydrolysis took place, the remaining 8 per cent. consisting of the new (acid-resistant) sugar.

UNDER THE ORDER IN COUNCIL dated February 6, 1928, the Lord President of the Council has appointed Sir James Alfred Ewing to be a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research, to fill a vacancy occasioned by the death of Mr. Robert Whyte Reid.

EXPORTS OF TARTARIC MATERIALS from Chile to the United States amounted in 1928 to 226,774 lb., valued at $21,376, compared with 220,947 lb., value $15,575 in 1927. Argols comprised the principal item, increasing in total value from $15,125, in 1927 to $20,454, in 1928, and accompanied by a rise in the invoice price from $0.069 to $0.095 per lb.

THE DIRECTORS of Continuous Coal Carbonisation state in a circular that the new standard type and size of container which will be used at the Erith works has been tested under the proper heat conditions by the Incandescent Heat Co. at their Birmingham works, and that the results obtained from the tests prove that with this unit remarkably lower heat and labour costs will be obtained.

THE TWELFTH EXPOSITION of Chemical Industries was opened on Monday at the Grand Central Hotel, New York City, and continued throughout the week. There were over 450 exhibits of raw materials, chemicals, dyestuffs, machinery, laboratory equipment, instruments of precision, etc. A feature of the exposition was a series of conferences at which scientific and industrial problems were discussed.

THE KOLIN CHEMICAL CO., with plants located at Kolin, Pecky and Budejovice, Bohemia, and a branch factory near Vienna, has recently been granted a patent to manufacture luminous paints by the Czechoslovak Patent Office. This is the first attempt to produce luminous paints in that country. The paints will be of various colours, but principally of blue and violet shades. Colours will be combined with substances such as radium, uranium, sulphides of barium, strontium and calcium.

IN CONNECTION with the Newcastle Chemical Industry Club it is announced that a golf cup, to be known as the "Trobridge Cup," has been presented for competition among the club members, the winner to hold the cup for one year and to receive a replica. This year's competition will be held on the Ravensworth Golf Course on Monday, June 3. It was also arranged for a party of club members to visit Borcovicus and the Witherite Mines at Settlingstones to-day (Saturday). The Northumberland Lakes may also be visited. Further excursions are being arranged to Bamburgh and Farne Islands on Sunday, June 9, and to Allendale and Allenheads on Saturday, June 15.

Obituary

COLONEL W. ROBINSON, formerly professor of chemistry and geology at the United States Military Academy, aged 64.

MR. JAMES H. HASTE, director of the Rochester works of the Eastman Kodak Co., recently, aged 61. He worked out a method for the large-scale production of nitrocellulose which was of great importance for the manufacture of photographic film.

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APPARATUS.—Apparatus for filling pipettes and burettes with corrosive substances. R. F. McCrackan. *J. Chemical Education*, April, p. 733.

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The reaction of sulphur dioxide with nitrogen peroxide. W. Manchot and H. Schmid. *Berichte*, May 1, pp. 1261–1263.

The occurrence of pyridine bases in tar oil from Russian bituminous shales. J. Dodonow and E. Soschestwenskaja. *Berichte*, May 1, pp. 1348–1352.

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Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Complete Specifications

309,001. Synthesising Nitrogen Compounds. H. E. Potts, Liverpool. From H. Plauson, 51, Hagedornstrasse, Hamburg 37, Germany. Application date, December 30, 1927.

Nitrogen compounds are synthesised by subjecting nitrogen and another gas or gases to the action of an intense beam of β-rays having a velocity above half the velocity of light. The rays may be produced in a Coolidge tube provided with a thin metal window opposite the emitting surface and adjacent to the reaction chamber. A voltage of 250,000-350,000 is necessary. The β-rays may act on such substances as glass, quartz or felspar to produce X-radiation which assists the action of the β-rays on the gases. The gases are also subjected simultaneously to an intense electric field. The action of the β-rays is increased by causing them to rotate by passing through a rotating magnetic field. The activated gases may be subjected during or after radiation treatment to high pressure and/or temperature (200-1000 atmospheres), and catalysts employed in ammonia synthesis are preferably present. Examples are given of the treatment of air, to obtain nitrogen oxides and nitric acid, water gas to obtain urea and ammonium compounds, nitrogen and hydrogen to obtain ammonia. The catalysts are preferably in finely divided form in suspension in the gas.

309,002. Synthesis of Liquid Hydrocarbons. H. E. Potts, Liverpool. From H. Plauson, 51, Hagedornstrasse, Hamburg 37, Germany. Application date, December 30, 1927.

The process described in Specification No. 309,001 above is applied to the treatment of gases containing carbon compounds such as water gas, ethylene, acetylene, to obtain liquid hydrocarbons.

309,005. Oxygenated Organic Compounds, Manufacture of. A. Carpmael, London. From I. G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, December 31, 1927.

These compounds are obtained from alkyl-benzenes having two or more carbon atoms in the side chain by oxidising them in liquid phase at an elevated temperature, and in the presence of an oxidation catalyst. The catalysts employed include oxides of silver, copper, zinc, nickel, iron, cobalt, hydroxides of copper, zinc, manganese, iron, nickel, cobalt, acetates, benzoates, stearates, and resinates of iron and manganese. The temperature varies from 50° C. to the boiling point of the hydrocarbon. The process is applicable to the oxidation of ethyl-benzene to acetophenone and methyl-phenyl-carbinol, isopropyl-benzene to acetophenone and dimethyl-phenyl-carbinol, and examples are given of these reactions, employing various catalysts.

309,051. Titanium-Containing Compounds, Manufacture of. F. G. C. Stephens, L. J. Anderson and W. A. Cash, of National Metal and Chemical Bank, Ltd., Adelaide House, King William Street, London, E.C.4. Application date, October 1, 1927.

A solution of a titanium salt, which may be obtained by treating ilmenite with sulphuric acid, is hydrolysed by adding to warm or boiling water containing a substance other than colloidal titanium oxide, which ensures that the precipitated hydrated titanium oxide is in suitable condition for use as a pigment. The precipitated oxide is washed, neutralised and calcined, and may be used alone or associated with other substances. The substance added to the water employed for hydrolysis is preferably silicic acid.

309,057. Carrying Out of Reactions at High Pressures and Temperatures. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, December 2, 1927.

Apparatus for the destructive hydrogenation of carbonaceous materials such as coal, tars, oils, under pressure is constructed with double walls to increase the range of temperature and pressure which may be used. The inner wall of the apparatus may consist of an alloy of nickel 60 per cent., chromium 20 per cent., iron, chromium and vanadium, or chromium and tungsten, 20 per cent., or of V2A steel. The outer wall may consist of a nickel, chromium or tungsten steel. The inner wall is thus particularly resistant to chemical reaction and the outer wall is mechanically strong. The inner wall is detachable and renewable.

309,200. Mono- and Polyhydric Alcohols, Manufacture and Production of. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 28, 1927.

These alcohols are obtained by subjecting to catalytic hydrogenation, in the presence or absence of solvents, the reaction mixture obtained in the condensation of aldehydes or ketones or mixtures of these, *e.g.*, in the aldol condensation. The hydrogenation is effected directly or after removal of the non-condensed aldehydes or ketones, and, when required, after neutralisation, but without separation of the condensation products from the condensing agents. Some examples are given of the treatment of crude aldol to obtain 1 : 3-butyleneglycol, and other similar reactions. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 to 1928 to Specification No. 17,193 of 1913.

309,258. Effecting Chemical Reactions Under Pressure. Synthetic Ammonia and Nitrates, Ltd., Billingham, Stockton-on-Tees, Durham, and A. Hall, The Green, Norton-on-Tees, Durham. Application date, February 1, 1928.

The destructive hydrogenation of oils, tars, etc., is effected in a vertical tower which is very high in proportion to its width. The liquid to be treated and the hydrogen are both introduced at the bottom, and the liquid is agitated by the hydrogen as it rises through the tower. The liquid is agitated locally, but is not substantially mixed, by means of the hydrogen. The apparatus is suitable for reactions at high pressures, *e.g.*, 800 atmospheres.

309,298. Sulphuric Acid and Cement, Manufacture of. K. Gordon, Norton Hall, The Green, Norton-on-Tees, Durham, and Imperial Chemical Industries, Ltd., Broadway Buildings, Broadway, Westminster, London, S.W.1. Application date, March 31, 1928.

Calcium sulphate, carbonaceous materials, and silicious materials are treated in a kiln, and the sulphurous gases passed to a Glover tower at 250°-300° C. Air is admitted to the kiln in slight excess over that necessary to burn the fuel, so that the effluent gases are at 400°-500° C. and contain about 2 per cent. of oxygen. The additional air necessary to bring the oxygen up to 8-9 per cent. is added at atmospheric temperature after the gases leave the tower and before passing into the lead chambers. The temperature of the gases entering the Glover tower can thus be maintained sufficiently high for the reactions in the tower.

309,300. Hydrogenation of Pyridine and/or Its Homologues. Technical Research Works, Ltd., and E. J. Bush, 4, Milner Street, London, S.W.3. Application date, March 31, 1928.

Pyridine is hydrogenated by passing it in a liquid state at a temperature of 180° C. over a nickel catalyst made as described in Specification No. 203,218 (see The Chemical Age, Vol. IX, p. 377) in an atmosphere of hydrogen at a pressure of 300 lb. per square inch. The main product is piperidine.

Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age, when they became open to inspection under the International Convention : 287,846 (E. I. DuPont de Nemours and Co.), relating to esters and other organic compounds, see Vol. XVIII, p. 516 ; 292,950 (I.G. Farbenindustrie Akt.-Ges.), relating to N-oxyethyl derivatives of 2-amino-1-oxybenzene, see Vol. XIX,

p. 195; 293,450 (Metallges. Akt.-Ges.), relating to sulphuric acid by the contact process, see Vol. XIX, p. 219; 293,010 (B. Talbot), relating to metallurgical furnaces, see Vol. XIX, p. 31 (Metallurgical Section).

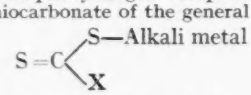
International Specifications not yet Accepted

306,803. HYDROGENATING ORGANIC COMPOUNDS. Selden Co., 339, 2nd Avenue, Pittsburg, U.S.A. (Assignees of A. O. Jaeger, 9, North Grandview Avenue, Crafton, Pa., U.S.A.). International Convention date, February 25, 1928.

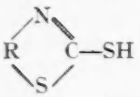
The catalysts described in Specification 304,640 (see THE CHEMICAL AGE, Vol. XX, p. 320) are used for hydrogenating benzene, its homologues and derivatives, naphthalene, anthracene, naphthols, phenanthrene, acetylene, propylene, styrene, stilbene, etc., unsaturated alcohols, esters of fumaric, maleic, or acrylic acids, allyl ethers, unsaturated aldehydes, ketones, acids, etc.

306,842. THIAZOLE DERIVATIVES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, February 24, 1928.

An *o*-aminoaryl-sulphocyanogen compound is treated with an alkali and a thiocarbonate of the general formula



where X indicates O-alkali metal, S-alkali metal, or O-alkyl, to obtain 2-mercapto-arylene-thiazoles of the formula



where R is an arylene residue, substituted or not. Examples are given.

306,935. CONCENTRATING CAUSTIC ALKALIES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, February 29, 1928.

Concentrated lyes are evaporated in an inclined rotary tube made of or lined with silver, to obtain fused caustic alkalies.

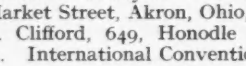
306,939. AMINOPHENOLS. Chemische Fabrik Grünau Landshoff und Meyer Akt.-Ges., 44, Copenickerstrasse, Grünau, near Berlin. International Convention date, February 29, 1928.

The condensation product of *p*-aminophenol and formaldehyde is reduced with activated aluminium in alkaline solution to obtain *N*-methyl-*p*-aminophenol. The condensation and reduction may be effected in one operation.

306,963. DYES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, February 29, 1928.

A cyanogen group is introduced into the β-position of an anthraquinone derivative containing an arylamino residue in at least one α-position, or an arylamino residue is introduced into at least one α-position of an anthraquinone derivative containing a cyanogen group in the β-position and the resulting dyestuff base sulphonated. Thus, 1-*p*-tolylamino-3-bromanthraquinone is obtained from 1 : 3-dibromanthraquinone and *p*-toluidine, and then heated with cuprous cyanide in quinoline and the product sulphonated.

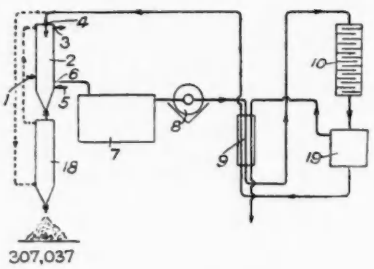
307,013. INDIARUBBER. Goodyear Tire and Rubber Co., 1,144, East Market Street, Akron, Ohio, U.S.A. (Assignees of A. M. Clifford, 649, Honodle Avenue, Akron, Ohio, U.S.A.). International Convention date, March 1, 1928.

Ageing of india-rubber is prevented by adding substances having the formula 

where R is a hydrocarbon residue. Phenyl-aminobenzyl alcohols and *p*-α- or -β-naphthyl-aminobenzyl alcohols are examples.

307,037. AMMONIUM SULPHATE. Union Chimique Belge Soc. Anon., 61, Avenue Louise, Brussels. International Convention date, March 2, 1928.

Gas from fuel distillation is treated with ammoniacal liquor in a tower 2 to separate acid impurities. The washing liquor is saturated with ammonium sulphate, and the addition of ammonia or ammonium carbonate in the scrubbing tower causes crystallisation of ammonium sulphate which is discharged into a vessel 18 and washed with some of the liquor supplied through pipe 4. The liquor leaves the tower through pipe 6 and is treated in a vessel 7 with a suspension of calcium

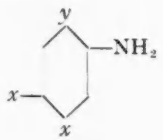


307,037

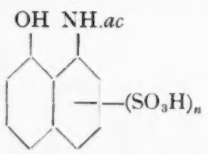
sulphate which reacts with the ammonium salts, and calcium carbonate is separated in a filter 8. The filtrate passes through heat exchanger 9 to a still 10 where ammonia and volatile acids are separated. The residual ammonium sulphate solution is concentrated in an evaporator 19 and returned to the tower 2. Carbon dioxide is separated from furnace gas by this process.

307,303 and 307,306. DYES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention dates, March 2 and 3, 1928.

307,303. A diazotized amine of the general formula



in which one *x* represents an acidylamino-group, the other *x* and *y* being an alkyloxy-, aralkyloxy-, aryloxy-, or a methyl group, is coupled with a component of the formula



in which *ac* represents an acidyl group and *n* is 1 or 2. The resulting monoazo dyes give reddish violet to greenish blue shades on wool from an acid bath.

307,306. 5-amino-4[1]-acylamino-1 : 1[1]-anthrimido-carbazoles and their derivatives containing halogen, alkoxyl, and hydroxyl groups in the anthraquinone nuclei are obtained by saponifying the corresponding diacyl-amino compounds with alcoholic caustic alkali or heating with sulphuric acid to 60° C., so that the acylamino group in the 5-position, but not in the 4-position, is saponified. The products may be used as vat dyes giving reddish shades on cotton, fast to chlorine, or as intermediates. Examples are given.

307,343. BENZOIC ACID. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, March 5, 1928.

Benzoic acid is obtained catalytically from phthalic acid, phthalic anhydride, or naphthalene, and purified by reducing the naphthoquinone impurities to naphthohydroquinones, and converting the phthalic anhydride to phthalic acid. These compounds are then removed by leaching with water.

307,345. ALUMINIUM COMPOUNDS.—W. Bachmann, Seelze, near Hanover, Germany. International Convention date, March 5, 1928.

Aluminium chloride, nitrate, or sulphate is treated with alkali or ammonium fluoride in solution or suspension, to obtain aluminium fluoride or alkali-aluminium fluoride, from which aluminates may be obtained. Examples are given.

LATEST NOTIFICATIONS.

310,365. Process for the production of anhydrous chlorides. I.G. Farbenindustrie Akt.-Ges. April 24, 1928.
310,507. Manufacture of nitrous oxide. Friederich, W. April 27, 1928.
310,529. Process for preparing 6-alkoxy-5:8-diamino-quinolines. Vereinigte Chemische Werke Akt.-Ges. April 28, 1928.
310,340. Process for smoothing paper. I.G. Farbenindustrie Akt.-Ges. April 23, 1928.
310,534. Manufacture of heterocyclic bases of the amino-imidazoline series. I.G. Farbenindustrie Akt.-Ges. April 27, 1928.
310,536. Process and apparatus for recovering neutral ammonium sulphate from the saturated mother liquor of ammonia works. Still, C. April 28, 1928.
310,425. Process for the recovery of copper from spent copper lyes. I.G. Farbenindustrie Akt.-Ges. April 25, 1928.
310,479. Process for the manufacture of triple superphosphates. Palazzo, F. C. April 26, 1928.
310,549. Process for the decomposition of thiocyanic acid and its salts. Hansen, Dr. C. J. April 28, 1928.
310,757. Manufacture of ortho-aryl-carboxyamido-thio-glycollic acids. I.G. Farbenindustrie Akt.-Ges. April 28, 1928.
310,758. Process for producing fast tints on wool. Soc. of Chemical Industry in Basle. April 29, 1928.

Specifications Accepted with Date of Application

283,467. Aromatic nitroso compounds, Treatment of. R. Vidal. January 8, 1927.
283,840–1. Synthetic rubber, Manufacture of. I.G. Farbenindustrie Akt.-Ges. January 14 and 15, 1927.
283,897. Azo-dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. January 19, 1927.
284,644. 1-phenyl-2-methylamino-propanol-1, Preparation of. W. Merck, K. Merck, L. Merck, W. Merck, and F. Merck. February 2, 1927.
285,389. Vat-dyestuffs of the 2-thio-naphthene-3-indolindigo series, Manufacture of. I.G. Farbenindustrie Akt.-Ges. February 14, 1927.
287,845. Vat dyestuffs of the pyrenequinone series, Manufacture of. I.G. Farbenindustrie Akt.-Ges. March 26, 1927. Addition to 287,050.
288,577. Exothermic catalytic chemical reactions, Processes for carrying out under pressure. Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. April 12, 1927.
293,768. Cycloketones, polycycloketones, and quinones, Manufacture of. I.G. Farbenindustrie Akt.-Ges. July 11, 1927.
296,758. Vat dyestuffs of the anthracene series, Manufacture of. I.G. Farbenindustrie Akt.-Ges. September 7, 1927.
305,105. Steel, Manufacture of. Stahlwerk Becker Akt.-Ges. December 30, 1926.
306,445. Metallic tin, Production of. Cayzer Tin Smelting Co. (Proprietary), Ltd. February 20, 1928.
307,037. Ammonium sulphate, Process of producing. Union Chimique Belge Soc. Anon. March 2, 1928.
309,848. Copper, Melting and refining of. H. H. Alexander. January 16, 1928.
309,888. Regeneration of catalysts. H. S. Hirst, S. W. Rowell, and Imperial Chemical Industries, Ltd. January 17, 1928.
309,970. Dyestuff Intermediates. R. S. Barnes, J. E. G. Harris, B. Wylam, J. Thomas, and Scottish Dyes, Ltd. January 17, 1928.
309,971. Steel and steel alloys, Manufacture of. F. C. Langenberg and M. A. Grossmann. January 18, 1928.
309,940. Complex copper ores, Treatment of. W. G. Perkins. January 18, 1928.
310,074. Basic derivatives of substituted quinoline carboxylic acids, Manufacture of. Soc. of Chemical Industry in Basle, and K. Miescher. December 22, 1927. Addition to 270,339.
310,076. Condensation products of the benzodiazine series, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) January 16, 1928. Addition to 309,102.
310,119. Metals and alloys, Refining and mixing of. T. D. Kelly. February 13, 1928.
310,230. Alkali nitrates from alkali chlorides, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) June 25, 1928.
310,252. Reduction of ores of metals capable of volatilization. F. L. Duffield. August 4, 1928.
310,276. Calcium nitrate and ammonium nitrate, Method of producing a mixture of. Kunstdunger-Patent-Verwertungs-Akt.-Ges. June 5, 1928. Addition to 301,486.
313,063. Eliminating sulphur compounds from gases. J. Y. Johnson (*I.G. Farbenindustrie Akt.-Ges.*). October 20, 1927.
282,744. Steel, Manufacture of. Stahlwerk Becker Akt.-Ges. December 30, 1926.
309,879. Azo dyestuffs. O. Y. Imray. (*I.G. Farbenindustrie Akt.-Ges.*) December 16, 1927.
310,069. Oxidation of aliphatic compounds of high molecular weight. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) December 17, 1927.
282,452. Products of the anthraquinone series. I.G. Farbenindustrie Akt.-Ges. December 20, 1926. Addition to 276,408.

Applications for Patents

Appareils et Evaporateurs Kestner. Production of nitrate of lime. 13,806. May 3. (France, April 3.)
Brightman, R., and Imperial Chemical Industries, Ltd. Manufacture of azo dyes, etc. 13,269. April 29.
British Cyanides, Co., Ltd., and Rossiter, E. C. Manufacture of mouldings of synthetic resins. 13,724. May 2.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of acetic anhydride. 13,258. April 29.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of dyestuffs. 13,453, 13,454. April 30.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Solutions of salts of para dialkyl-amino-aryl-phosphinous acids. 13,455. April 30.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of compounds of pyrazol-anthrone series, etc. 13,595. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Inhibiting, etc., capacity of animal fibres. 13,596. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of soluble compositions for dyeing and printing. 13,597. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of materials resistant to micro-organisms. 13,598. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of sulphonated condensation products. 13,599. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of purified butadiene, etc. 13,600. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of anthraquinone dyestuffs. 13,601. May 1.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of paints. 13,718, 13,719. May 2.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of phenanthridone, etc. 13,720. May 2.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Accelerating vulcanisation of rubber. 13,721. May 2.
Challenor, W. A. P., and Crawford, F. A. F. Chemical processes. 13,864. May 3.
Chemische Fabrik vorm. Sandoz. Preparation of water-soluble dyes. 13,977. May 4. (Germany, November 27, 1928.)
Duckham, A. M., and Woodall-Duckham (1920), Ltd. Producing chemical changes by heating. 13,966. May 4.
Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Kinematograph cameras. 13,260. April 29.
Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Manufacture of azo dyestuffs. 13,842. May 3.
I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Production of solid urea, etc. 13,237. April 29.
I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of fertilisers. 13,691. May 2.
I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of nitro compounds. 13,693. May 2.
I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of azo dyestuffs. 13,842. May 3.
I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Conversion of olefines. 13,953. May 4.
I.G. Farbenindustrie Akt.-Ges. Production of dichlorethylene. 13,250. April 29. (Austria, May 5, 1928.)
I.G. Farbenindustrie Akt.-Ges. Development of sols. 13,259. April 29. (Germany, April 30, 1928.)
I.G. Farbenindustrie Akt.-Ges. Manufacture of ortho-arylcarboxy-amido-thio-glycollic acids. 13,265. April 29. (Germany, April 28, 1928.)
Imperial Chemical Industries, Ltd., and Woolcock, J. W. Production of compounds from propylene. 13,460. April 30.
Imperial Chemical Industries, Ltd., Lodge, F., and Tatum, W. W. Manufacture of anthraquinone derivatives. 13,461. April 30.
Imperial Chemical Industries Ltd., Linch, F. W., and Rodd, E. H. Production of fast dyeings on cellulose esters, etc. 13,729. May 2.
Imperial Chemical Industries, Ltd. Chemical processes. 13,864. May 3.
Imperial Chemical Industries, Ltd. Releasing pressure of mixtures of solids, etc. 13,916. May 4.
Kaufmann, H. P. Compounds of alkaline earth nitrites with methyl xanthines. 13,716. May 2. (Germany, May 7, 1928.)
Marconi, M. Synthesis of toluene. 13,322. April 29.
Soc. of Chemical Industry in Basle. Production of fast tints on wool. 13,266. April 29. (Switzerland, April 29, 1928.)
Urbain, E. Manufacture of ammonia. 13,856. May 3. (France, May 10, 1928.)
Urbain, E. Manufacture of ammonia. 13,922. May 4. (France, May 18, 1928.)
Urbain, E. Manufacture of phosphorus chlorides. 13,923. May 4. (France, May 31, 1928.)
Urbain, E. Manufacture of ammonia. 13,924. May 4. (France, July 4, 1928.)

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID BORIC, COMMERCIAL.—Crystal, £30 per ton; powder, £32 per ton; extra fine powder, £34 per ton.

ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° TW.—£21 10s. to £27 per ton, makers' works, according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER.—Spot, £9 10s. per ton d/d; Contract, £8 10s. per ton d/d, 4-ton lots.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £19 per ton; powder, £21 per ton. (Packed in 2 cwt. bags carriage paid any station in Great Britain.)

CALCIUM CHLORIDE (SOLID).—£5 to £5 5s. per ton d/d carr. paid.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE.—4½d. per lb.

POTASSIUM CHLORATE.—3⅞d. per lb., ex-wharf, London, in cwt. kegs.

SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.

SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.

SODA CRYSTALS.—£5 to £5 5s. per ton, ex railway depots or ports.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE.—£10 10s. per ton carr. paid.

SODIUM BICHROMATE.—3½d. per lb.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included: £15 10s. f.o.r. London.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.

SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. paid.

SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. paid.

SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.b. London, 1-cwt. kegs included.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—6¼d. to 6⅝d. per lb. Crude 60's, 1s. 10d. per gall.

ACID CRESYLIC 99/100.—2s. 3d. to 2s. 9d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 10d. to 1s. 11d. per gall. Dark, 1s. 7½d. to 1s. 8½d.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—5½d. to 6d. per gall. 1100, 6d. to 6¼d. per gall.; 1110, 6½d. per gall. Unstrained, 6⅝d. to 7d. per gall.

BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall; Pure, 1s. 10d. to 1s. 11d. per gall.

TOLUOLE.—90%, 1s. 7¼d. to 2s. per gall. Firm. Pure, 2s. to 2s. 2d. per gall.

XYLOL.—1s. 5d. to 2s. per gall. Pure, 1s. 8d. to 1s. 9d. per gall.

CREOSOTE.—Cresylic, 20/24%, 7⅛d. to 7⅜d. per gall.; Heavy, 6¼d. to 6½d. per gall. Middle oil, 4½d. to 5d. per gall. Standard specification, 3¼d. to 4½d. per gall. Light gravity, 3d. to 3¼d. per gall. ex works. Salty, 7½d. per gall.

NAPHTHA.—Crude, 8½d. to 9d. per gall. Solvent, 90/160, 1s. 3½d. to 1s. 4d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 8d. per gall. Solvent 90/190, 1s. 1d. to 1s. 4d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £12 5s. to £14 10s. per ton. Quiet Flaked, £14 to £15 per ton, according to districts.

PITCH.—Medium soft, 31s. 6d. to 35s. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 4s. to 4s. 6d. per gall. 90/160, 3s. 9d. to 4s. per gall. 90/180, 2s. to 3s. per gall. Heavy, 1s. 6d. to 1s. 9d. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 8½d. per lb.

ACID GAMMA.—4s. 6d. per lb.

ACID H.—3s. per lb.

ACID NAPHTHIONIC.—1s. 6d. per lb.

ACID NEVILLE AND WINTHER.—4s. 9d. per lb.

ACID SULPHANILIC.—8½d. per lb.

ANILINE OIL.—8d. per lb. naked at works.

ANILINE SALTS.—8d. per lb. naked at works.

BENZALDEHYDE.—2s. 3d. per lb.

BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.

BENZOIC ACID.—1s. 8½d. per lb.

o-CRESOL 29/31° C.—5½d. per lb.

m-CRESOL 98/100%.—2s. 3d. to 2s. 6d. per lb.

p-CRESOL 32/34° C.—2s. 3d. to 2s. 6d. per lb.

DICHLORANILINE.—1s. 10d. per lb.

DIMETHYLANILINE.—1s. 11d. per lb.

DINITHROBENZENE.—8d. per lb. naked at works. £75 per ton.

DINITROCHLORBENZENE.—£84 per ton d/d.

DINITROTOLUENE.—48/50° C. 7½d. per lb. naked at works. 66/68° C. 9d. per lb. naked at works.

DIPHENYLAMINE.—2s. 10d. per lb. d/d.

a-NAPHTHOL.—2s. per lb. d/d.

B-NAPHTHOL.—10d. per lb. d/d.

a-NAPHTHYLAMINE.—1s. 3d. per lb.

B-NAPHTHYLAMINE.—3s. per lb.

o-NITRANILINE.—5s. 9d. per lb.

m-NITRANILINE.—3s. per lb. d/d.

p-NITRANILINE.—1s. 8d. per lb.

NITROBENZENE.—6d. per lb. naked at works.

NITRONAPHTHALENE.—1s. 3d. per lb.

R. SALT.—2s. 2d. per lb.

SODIUM NAPHTHIONATE.—1s. 8½d. per lb. 100% basis d/d.

o-TOLUIDINE.—8d. per lb.

p-TOLUIDINE.—1s. 9d. per lb. naked at works.

m-XYLIDINE ACETATE.—2s. 6d. per lb. 100%.

N. W. ACID.—4s. 9d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£78 per ton.

CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.

RED LIQUOR.—9d. to 10½d. per gall. 16° Tw.

WOOD CRESOTE.—1s. 9d. per gall. Unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d. per gall. Solvent, 4s. to 4s. 3d. per gall.

WOOD TAR.—£3 10s. to £4 10s. per ton.

BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 9d. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.

CADMIUM SULPHIDE.—5s. to 6s. per lb.

CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity

CARBON BLACK.—5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£45 to £54 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 9d. per lb.

INDIARUBBER SUBSTITUTES, WHITE AND DARK.—4⅝d. to 5¼d. per lb.

LAMP BLACK.—£32 10s. per ton, barrels free.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE, 30%.—£23 per ton.

MINERAL RUBBER "RUBPRON."—£13 12s. 6d. per ton, f.o.r. London.

SULPHUR.—£10 to £12 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra

SULPHUR PRECIP. B. P.—£55 to £60 per ton.

THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb., carriage paid.

THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.

VERMILION, PALE OR DEEP.—6s. 10d. to 7s. per lb.

ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£39 per ton ex wharf London in glass containers.

ACID, ACETYL SALICYLIC.—2s. 6d. to 2s. 8d. per lb.

ACID, BENZOIC, B.P. 2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 3d. to 1s. 4d. per oz., according to quantity.

ACID, BORIC B.P.—Crystal, 36s. to 39s. per cwt.; powder, 40s. to 43s. per cwt.; extra fine powder, 42s. per cwt., according to quantity. Carraige paid any station in Great Britain, in ton lots.
ACID, CAMPHORIC.—19s. to 21s. per lb.
ACID, CITRIC.—2s. 1d. to 2s. 2d. per lb., less 5%.
ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.
ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.
ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 7d. per lb. Technical.—10½d. to 11½d. per lb.
ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.
ACID, TARTARIC.—1s. 4½d. per lb., less 5%.
ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.
AMIDOL.—7s. 6d. to 9s. per lb., d/d.
AMIDOPYRIN.—7s. 9d. to 8s. per lb.
AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.
AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.
ATROPHINE SULPHATE.—9s. per oz.
BARBITONE —5s. 9d. to 6s. per lb.
BENZONAPHTHOL.—3s. to 3s. 3d. per lb. spot.
BISMUTH CARBONATE.—9s. 9d. per lb.
BISMUTH CITRATE.—9s. 3d. per lb.
BISMUTH SALICYLATE.—8s. 9d. per lb.
BISMUTH SUBNITRATE.—8s. 3d. per lb.
BISMUTH NITRATE.—Cryst. 5s. 9d. per lb.
BISMUTH OXIDE.—12s. 3d. per lb.
BISMUTH SUBCHLORIDE.—10s. 9d. per lb.
BISMUTH SUBGALLATE.—7s. 9d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.
BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W Qts. 11d. per lb.
BORAX B.P.—Crystal, 24s. to 27s. per cwt.; powder, 25s. to 28s. per cwt., according to quantity. Carriage paid any station in Great Britain, in ton lots.
BROMIDES.—Ammonium, 2s. 2½d. per lb.; potassium, 1s. 11½d. per lb.; granular, 1s. 10¾d. per lb.; sodium, 2s. 1½d. per lb.
CALCIUM LACTATE.—B.P., 1s. 2½d. to 1s. 3½d. per lb.
CAMPHOR.—Refined flowers, 2s. 11d. to 3s. per lb., according to quantity; also special contract prices.
CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.
CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.
CREOSOTE CARBONATE.—6s. per lb.
ETHERS.—S.G. ·730—11d. to 1s. per lb., according to quantity other gravities at proportionate prices.
FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.
GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.
HEXAMINE.—2s. 3d. to 2s. 6d. per lb.
HOMATROPINE HYDROBROMIDE.—30s. per oz.
HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.
HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchesters, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.
HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.
HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8¼d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.
IRON AMMONIUM CITRATE.—B.P., 2s. 9d. per lb. Green, 3s. 1d. per lb. Prices for 1 cwt. lots. U.S.P., 2s. 9d. to 3s. per lb.
IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.
IRON QUININE CITRATE.—B.P., 8¾d. to 9¼d. per oz., according to quantity.
MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.
MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.
MENTHOL.—A.B.R. recrystallised B.P., 22s. per lb. net; Synthetic, 11s. to 12s. per lb.; Synthetic detached crystals, 11s. to 16s. per lb., according to quantity; Liquid (95%), 9s. 6d. per lb.
MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.
METHYL SALICYLATE.—1s. 5d. to 1s. 8d. per lb.
METHYL SULPHONAL.—18s. 6d. to 20s. per lb.
METOL.—9s. to 11s. 6d. per lb. British make.
PARAFORMALDEHYDE.—1s. 9d. per lb. for 100% powder.
PARALDEHYDE.—1s. 4d. per lb.
PHENACETIN.—2s. 6d. to 2s. 9d. per lb.
PHENAZONE.—3s. 11d. to 4s. 2d. per lb.
PHENOLPHTHALEIN.—6s. to 6s. 3d. per lb.
POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—96s. per cwt., less 2½ per cent.
POTASSIUM CITRATE.—B.P.C., 2s. 7d. per lb. in 1 cwt. lots.
POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.
POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.
POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.
POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.
QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins.
RESORCIN.—2s. 10d. to 3s. per lb., spot.
SACCHARIN.—47s. per lb.; in quantity lower.
SALOL.—2s. 3d. to 2s. 6d. per lb.
SODIUM BENZOATE, B.P.—1s. 8d. to 1s. 11d. per lb.
SODIUM CITRATE, B.P.C., 1911.—2s. 4d. per lb., B.P.C. 1923—2s. 7d. per lb. Prices for 1 cwt. lots. U.S.P., 2s. 6d. to 2s. 9d. per lb., according to quantity.
SODIUM FERROCYANIDE.—4d. per lb., carriage paid.
SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.
SODIUM NITROPRUSSIDE.—16s. per lb.
SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—100s. to 105s. per cwt. Crystals, 5s. per cwt. extra.
SODIUM SALICYLATE.—Powder, 2s. 2d. to 2s. 4d. per lb. Crystal, 2s. 3d. to 2s. 5d. per lb.
SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.
SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £28 10s. per ton, according to quantity. Delivered U.K.
SULPHONAL.—9s. 6d. to 10s. per lb.
TARTAR EMETIC, B.P.—Crystal or powder, 2s. 1d. to 2s. 3d. per lb.
THYMOL.—Puriss., 9s. 1d. to 9s. 4d. per lb., according to quantity. Firmer. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.
AUBEPINE (EX ANETHOL).—11s. per lb.
AMYL ACETATE.—2s. 6d. per lb.
AMYL BUTYRATE.—5s. per lb.
AMYL SALICYLATE.—2s. 9d. per lb.
ANETHOL (M.P. 21/22° C.).—5s. 6d. per lb.
BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 10d. per lb.
BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 10d. per lb.
BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.
BENZYL BENZOATE.—2s. 3d. per lb.
CINNAMIC ALDEHYDE NATURAL.—14s. per lb.
COUMARIN.—9s. per lb.
CITRONELLOL.—10s. per lb.
CITRAL.—8s. 3d. per lb.
ETHYL CINNAMATE.—6s. 6d. per lb.
ETHYL PHTHALATE.—3s. per lb.
EUGENOL.—12s. 6d. per lb.
GERANIOL (PALMAROSA).—22s. per lb.
GERANIOL.—6s. 6d. to 10s. per lb.
HELIOTROPINE.—5s. 6d. per lb.
ISO EUGENOL.—14s. 3d. per lb.
LINALOL.—Ex Bois de Rose, 12s. 6d. per lb. Ex Shui Oil, 10s. per lb.
LINALYL ACETATE.—Ex Bois de Rose, 16s. per lb. Ex Shui Oil, 12s. per lb.
METHYL ANTHRANILATE.—8s. per lb.
METHYL BENZOATE.—4s. per lb.
MUSK KETONE.—34s. per lb.
MUSK XYLOL.—7s. per lb.
NEROLIN.—3s. 9d. per lb.
PHENYL ETHYL ACETATE.—11s. per lb.
PHENYL ETHYL ALCOHOL.—10s. per lb.
RHODINOL.—52s. per lb.
SAFROL.—2s. 3d. per lb.
TERPINEOL.—1s. 6d. per lb.
VANILLIN, EX CLOVE OIL.—18s. 6d. per lb. Ex Guaiacol, 15s. 6d. per lb.

Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. 6d. per lb.
ANISE OIL.—3s. per lb.
BERGAMOT OIL.—23s. 6d. per lb.
BOURBON GERANIUM OIL.—21s. per lb.
CAMPHOR OIL.—1s. 3d. per lb.
CANANGA OIL, JAVA.—12s. per lb.
CASSIA OIL, 80/85%.—6s. 3d. per lb.
CINNAMON OIL LEAF.—8s. 6d. per oz.
CITRONELLA OIL.—Java, 2s. per lb., c.i.f. U.K. port. Ceylon, pure, 2s. 2d. per lb.
CLOVE OIL (90/92%).—10s. 6d. per lb.
EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 10½d. per lb.
LAVENDER OIL.—Mont Blanc, 38/40%, 17s. 6d. per lb.
LEMON OIL.—17s. 6d. per lb.
LEMONGRASS OIL.—4s. per lb.
ORANGE OIL, SWEET.—25s. per lb.
OTTO OF ROSE OIL.—Anatolian, 35s. per oz. Bulgarian, 75s. per oz.
PALMA ROSA OIL.—13s. per lb.
PEPPERMINT OIL.—English, 87s. 6d. per lb.; Wayne County, 14s. 6d. per lb.; Japanese, 7s. 6d. per lb.
PETITGRAIN.—8s. 6d. per lb.
SANDALWOOD.—Mysore, 28s. 6d. per lb.: 90/95%. 20s. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, May 9, 1929.

THERE is nothing of outstanding importance to mention in this market, trade moving along quietly steady lines with very little fluctuations in prices. British makers report a slight increase in the prices of bichromate of soda and potash for delivery over the second half of the year. Export trade continues fairly satisfactory.

General Chemicals

ACETONE.—There is no important change in the position of this product, the market remaining firm at £75 to £85 per ton, and in rather short supplies.

ACID ACETIC.—A fairly regular business is passing at unchanged prices of £36 10s. to £37 10s. per ton for 80% technical quality.

ACID CITRIC.—The prices are inclined to move towards a higher level, and with the consuming season approaching, an expansion in the demand is looked for. Price nominally 2s. 2d. to 2s. 3d. per lb., less 5%, ex wharf.

ACID FORMIC.—There is slightly more interest shown in this product, with the price unchanged at £42 for 85% material.

ACID LACTIC.—Steady conditions continue, with the demand fair and price unchanged at £43 per ton for 50% by weight for pale technical quality.

ACID OXALIC.—The demand has been more active and the market remains firm. Price £30 10s. to £32 10s. per ton, according to quantity.

ACID TARTARIC.—The market is broadening, with demand more active and price firm at 1s. 4¾d., less 5%.

ALUMINA SULPHATE.—The firm conditions are maintained, with the price inclined to advance. The present figures are round about £7 15s. to £8 per ton for 17/18% technically free from iron quality.

AMMONIUM CHLORIDE.—Fair business is passing at unchanged rates.

ARSENIC.—Inquiry is still only for small quantities, and price remains easy at about £16 5s., f.o.r. the mines.

BARIUM CHLORIDE.—Continues a brisk market with the price firm at about £11 10s. per ton.

CREAM OF TARTAR.—A fairly active demand is coming to hand, with prices firm at £94 to £98 per ton, according to quantity, for 99/100% B.F. quality.

COPPER SULPHATE.—Inquiries are more numerous, and the price is firm at about £28 per ton for the best brands.

FORMALDEHYDE.—Quite a fair amount of business is coming to hand, with the price unchanged at about £39 per ton.

LEAD ACETATE.—Steady conditions continue, with price at £44 for white and £43 for brown.

LEAD NITRATE.—Unchanged at about £35 per ton.

LIME ACETATE.—The grey quality is in slightly better supply, with the price unchanged at £18 per ton.

LITHOPONE.—Steady at £19 15s. to £22 per ton.

METHYL ACETONE.—Unchanged in price at £58 to £60 per ton, with a steady demand.

POTASSIUM CHLORATE.—A small demand is being received, with prices unchanged at £28 to £30 per ton.

POTASSIUM PERMANGANATE.—Business is fairly active with the price firm at 5½d. per lb. for B.P. quality.

POTASSIUM PRUSSIATE.—There is an increased demand, with prices ruling firm at £63 10s. to £65 10s. per ton.

SODIUM ACETATE.—Standard crystals material is firm and in rather short supply. Spot material is on offer at about £22 per ton.

SODIUM BICHROMATE.—A slight advance to 3⅞d., with discounts for contracts, is announced by British makers, with the market exceedingly firm and with little if any outside material offering.

SODIUM HYPOSULPHITE.—The photographic "pea" crystal quality is in better demand, with price unchanged at £14 10s. to £15 per ton; commercial quality in rather slow demand.

SODIUM NITRITE.—In better request at about £20 per ton.

SODIUM PHOSPHATE.—The market is unchanged at about £12 per ton for dibasic and £17 for tribasic.

SODA PRUSSIATE.—Market continues active at 4¾d. to 5¼d. per lb., according to quantity.

TARTAR EMETIC.—Rather slow of sale at 11¾d. per lb.

ZINC SULPHATE.—In steady request at £12 per ton.

Coal Tar Products

The coal tar products market still remains quiet, and there is a temporary reduction in the prices of benzols and naphthas.

MOTOR BENZOL can be bought at 1s. 7d. to 1s. 7½d. per gallon, f.o.r. makers' works, for spot delivery.

SOLVENT NAPHTHA is quoted at 1s. 2½d. to 1s. 3d. per gallon f.o.r.

HEAVY NAPHTHA is quoted at 1s. 2d. per gallon, f.o.r.

CREOSOTE OIL is unchanged at 4¼d. per gallon on rail in the north, and at 5¼d. per gallon in London.

CRESYLIC ACID.—There is a slight stiffening in this market, although prices remain unchanged at about 1s. 10d. per gallon for the 98/100% quality and about 1s. 8d. per gallon f.o.r. for the dark quality 95/97%.

NAPHTHALENES are unchanged, the firelighter quality being quoted at about £4 10s. per ton, the 74/76 quality at about £5 per ton, and the 76/78 quality at £6 to £6 5s. per ton.

PITCH.—Makers are holding out for somewhat higher prices for next season, and are quoting 35s. f.o.b. East Coast, but there is little inclination to buy at this figure.

Nitrogen Products

Sulphate of Ammonia.—During the last week it is understood that the sales made at the scale price of £10 2s. per ton, f.o.b. U.K. port in single bags, have been very small. Now that the consuming season is coming to an end, there are small lots being offered at slightly lower prices. For the most part buyers are holding off, except when the sulphate is being required for immediate consumption, until the prices for the new year are announced.

Home.—Prices in the home market remain unchanged until, at the earliest, June 30. Merchants report a considerable slackening demand.

Nitrate of Soda.—The demand for this product continues good in the United States, and it is reported on the Continent that sales have been considerably in excess of last year.

Latest Oil Prices

LONDON, May 8.—LINSEED OIL was in fair request at barely yesterday's levels. Spot, ex mill, £28 17s. 6d.; May to August, £28 10s.; and September-December, £29 naked. RAPE OIL was steady. Crude extracted, £41 10s.; technical refined, £43 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £27 10s.; refined common edible, £34; and deodorised, £36, naked, ex mill. TURPENTINE was inactive. American spot, 44s. 9d.; May-June, 43s. 6d.; and July-December, 42s. 6d. per cwt.

HULL.—LINSEED OIL.—Spot to May, £28 12s. 6d.; June-August, £28 15s.; September-December, £28 17s. 6d. per ton, naked. Business was done in September-December at £18 16s. 3d. COTTON OIL.—Bombay crude, spot, £26; Egyptian crude, spot (new) and May and June-August, £26 10s.; edible refined spot and May-August, £30 5s.; technical, spot, £30; deodorised, spot, £32 5s. per ton, naked. PALM KERNEL OIL.—Crushed, 5½ per cent., £33 10s. per ton, naked. GROUNDNUT OIL.—Crushed-extracted, £32 5s.; deodorised, £36 5s. per ton. SOYA OIL.—Extracted, and crushed, £30; deodorised, £32 10s. per ton. RAPE OIL.—Crushed-extracted, £41; refined, £43 per ton, net, cash terms, ex mill. TURPENTINE, CASTOR OIL and COD OIL unaltered.

South Wales By-Products

THERE is no change in the general tendency of South Wales by-products. The market generally is weak and unsatisfactory. Pitch continues to be slow, and stocks appear to be so heavy that patent fuel manufacturers are being freely offered quantities at from 33s. to 35s. per ton delivered at works. Creosote remains depressed, and quotations are unchanged at 4¼d. to 5¼d. per gallon. Crude tar is being freely offered at 24s. to 26s. per ton f.o.b., while road tar is being quoted at 10s. to 12s. per 40-gallon barrel. Crude naphthalene maintains its price round about 80s. per ton, and has only a small call. Whizzed, with quotations round the 100s. per ton mark, is quiet. Refined tars continue to be fairly bright, and quotations are unchanged, coke oven tar changing hands at 7d. to 7¼d. per gallon, and gasworks tar at from 6¼d. to 6¾d. per gallon, both prices covering delivery. Patent fuel and coke exports remain slow and unsatisfactory, and fuel quotations are slightly lower, being quoted 21s. to 21s. 6d. ex ship Cardiff, and 19s. 6d. to 20s. 3d. ex ship Swansea. Coke quotations are:—Foundry, 27s. 6d. to 36s. 6d.; furnace, 23s. 6d. to 25s.; furnace (at ovens), 19s. to 20s.; and foundry (at ovens), 27s. 6d. to 33s. per ton.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, May 8, 1929.

THERE is little change of any importance to note in the heavy chemical market since our last report with one exception, that being a slight advance in the prices of home manufacturers for bichromates. Other prices remain practically unchanged.

Industrial Chemicals

ACETONE.—B.G.S. £76 10s. to £85 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID ACETIC.—98/100% Glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports. 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £32 per ton, packed in bags, carriage paid U.K. stations. There are a few fairly cheap offers made from the Continent.

ACID CARBOLIC ICE CRYSTALS.—Unchanged at 6¼d. per lb., delivered or f.o.b. U.K. ports.

ACID CITRIC B.P. CRYSTALS.—Quoted 2s. 2½d. per lb., less 5% ex store, spot delivery. Offered at 2s. 2¼d. per lb., less 5% ex wharf, prompt shipment from the Continent.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy; dearsenicated quality, 5s. 6d. per carboy, ex works, full wagon loads.

ACID NITRIC 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.

ACID OXALIC 98/100%.—Price remains unchanged at about 3½d. per lb., ex store. Offered for prompt shipment from the Continent at 3⅛d. per lb., ex wharf.

ACID SULPHURIC.—£2 15s. per ton, ex works, for 144° quality; £5 15s. per ton for 168° quality. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC B.P. CRYSTALS.—Spot material now quoted 1s. 4½d. per lb., less 5% ex wharf.

ALUMINA SULPHATE.—Spot material rather dearer at about £6 per ton, ex store. For prompt shipment, £5 15s. per ton, c.i.f. U.K. ports.

ALUM LUMP POTASH.—Unchanged at about £8 12s. 6d. per ton, c.i.f. U.K. ports. Crystal meal offered on spot at £9 per ton, ex store.

AMMONIA ANHYDROUS.—Quoted 7½d. per lb., carriage paid. Containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton; powdered, £38 per ton, packed in 5-cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID 880°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture, quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Quoted £37 per ton, c.i.f. U.K. ports, prompt shipment from China. Spot material unchanged at about £40 per ton, ex store.

ARSENIC WHITE POWDERED.—Unchanged at £18 5s. per ton, ex wharf, prompt despatch from mines. Spot material quoted £19 15s. per ton, ex store.

BARIUM CHLORIDE.—Quoted £10 10s. per ton, c.i.f. U.K. ports, prompt shipment.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 5s. per ton to £4 15s. per ton, according to quantity and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f. o.b. U.K. ports.

FORMALDEHYDE 40%.—Still in fairly good demand and price now quoted is £36 10s. per ton, ex store.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continenetal on offer at about £3 5s. per ton, ex wharf.

LEAD, RED.—On offer at £29 15s. per ton, ex store.

LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted £41 10s. per ton; brown on offer about £39 10s. per ton, ex store.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½% delivered.

POTASSIUM BICHROMATE.—Quoted 4¾d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance of 2½% for minimum 2½ tons to be taken.

POTASSIUM CARBONATE, 96/98%.—Spot material now quoted £26 10s. per ton, ex store. Offered from the continent £25 10s. per ton, c.i.f. U.K.

POTASSIUM CHLORATE, 99¾/100%.—Powder. Quoted £25 10s. per ton, ex wharf. Crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Offered for prompt shipment from the continent at 6⅞d. per lb., ex wharf. Spot material quoted 7d. per lb., ex store.

SODA CAUSTIC.—Powdered 98/99%. Now £17 10s. per ton in drums; £18 15s. per ton in casks. Solid 76/77% £14 10s. per ton in drums and 70/72% £14 2s. 6d. per ton in drums, all carriage paid buyers' stations, minimum four ton lots, for contracts 10s. per ton less.

SODIUM ACETATE 65%.—Crystal quality quoted £19 15s. per ton, ex wharf; 73/78% anhydrous quality on offer at £20 per ton, carriage paid buyers' stations.

SODIUM BICARBONATE.—Refined recrystallised £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Manufacturers advise an advance in price of ½d. per lb., making the spot price now 3⅜d. per lb. delivered as from July 1, with special concession for contracts from 2½ tons up to 25 tons.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality 27s. 6d. per ton extra. Light soda ash £7 1s. 3d. per ton, ex quay, minimum four-ton lots with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum four-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum four-ton lots. Prices for this year unchanged.

SODIUM NITRATE.—Ordinary quality quoted £10 12s. per ton, carriage paid buyers' sidings, minimum six-ton lots, usual extras for small quantities and refined qualities.

SODIUM PRUSSIATE.—Spot material quoted 7d. per lb. Offered for prompt shipment from the continent at 6¾d. per lb. c.i.f. U.K. ports.

SODIUM SULPHATE (SALTCAKE).—Prices 50s. per ton, ex works, 52s. 6d. per ton delivered for unground quality. Ground quality 2s. 6d. per ton. extra.

SODIUM SULPHIDE.—Prices for home consumption. Solid 60/62% £9 per ton. Broken 60/63% £10 per ton. Crystals 30/32% £7 2s. 6d. per ton, delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £10 7s. 6d. per ton; ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now quoted £22 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—Offered from the coneinent at about £10 5s. per ton, ex wharf.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Reduction in Price of Bromides

MAY AND BAKER, LTD., advise the following price reductions:—

Ammon. Bromide, list price, 2s. 2½d. per lb., 1 cwt. at 1s. 11½d. per lb.

Potass. Bromide Cryst., list price, 1s. 11½d. per lb., 1 cwt. at 1s. 8½d. per lb.

Potass. Bromide Gran., list price, 1s. 10¾d. per lb., 1 cwt. at 1s. 7¾d. per lb.

Sodium Bromide, list price, 2s. 1½d. per lb., 1 cwt. at 1s. 10½d. per lb.

Net prices, without engagement. Special rates apply for larger quantities and contracts.

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, May 9, 1929.

The demand for chemical products on this market since last report has been about up to the average of recent weeks. There has been a fair amount of inquiry in circulation in the open market, with moderate actual bookings, the bulk of them, however, being for comparatively small quantities. Specifications for deliveries against contracts are being received in a not unsatisfactory manner having regard to conditions in the textile and allied trades locally.

Heavy Chemicals

Sulphide of sodium keeps up fairly well although there is not a great deal of buying going on this section; the 60/65 per cent. concentrated solid quality is obtainable at round £9 per ton and the commercial grade at about £8. A moderate inquiry is reported for chlorate of soda, values of which are maintained in the neighbourhood of 2¾d. per lb. There is a quietly steady demand about for bichromate of soda and prices are firm on the basis of 3½d. per lb. Only a comparatively small trade is passing in phosphate of soda, but at round £11 15s. per ton quotations are pretty much the same as before. Bicarbonate of soda and alkali are moving off in fair quantities, with offers steady and unchanged at £10 10s. and £6 per ton, respectively. A steady business has been reported in respect of caustic soda at firm prices, these ranging from £12 15s. to £14 per ton, in contracts, according to delivery. With regard to prussiate of soda, quotations for this material are well held at from 4⅝d. to 5d. per lb., according to quantity, and a fair amount of inquiry is being received. Hyposulphite of soda is not attracting very much attention at the moment but there is no weakness in prices; the photographic quality is at about £15 10s. per ton and the commercial at £8 15s. Only a moderate trade is going through in the case of saltcake, quotations for which are at round £2 10s. per ton.

The demand for permanganate of potash this week has been on rather quiet lines, with the B.P. grade selling at round 5½d. per lb. and the commercial material at 5d. Yellow prussiate of potash is in quietly steady request at firm prices, current values being at 6¾d. to 7¼d. per lb., according to quantity. Chlorate of potash is on the quiet side at from 3d. to 3¼d. per lb., but bichromate keeps very steady at round 4¼d. per lb. and is attracting a fair amount of attention from buyers. Caustic potash quotations show no sign of giving way, offers this week being on the basis of £33 5s. per ton for prompt delivery of one to five-ton lots. Carbonate of potash is quoted to-day at £26 5s. per ton, a moderate business being put through in this section of the market.

There is still only a quiet trade passing in arsenic and prices are on the easy side, though not quotably changed on the week, at about £16 per ton, at the mines, for white powdered, Cornish makes. Current offers of sulphate of copper are at round £30 per ton, f.o.b., and a fair demand continues to be reported. There is not much stirring in the acetates of lead, but prices are steady at the lower levels of £40 per ton for the brown material and about £41 for the white. Nitrate of lead is selling slowly and quotations are easy at about £34 10s. per ton. With regard to the acetates of lime, these are firm and in moderate request at £17 5s. per ton for grey and £9 for brown.

Acids and Tar Products

Oxalic acid this week has been selling only in moderate quantities, but values remain at £1 11s. 6d. per cwt., ex store. Acetic acid is steady and a fair trade is being transacted; glacial is on offer at round £67 per ton and 80 per cent. commercial grade at £36. Citric acid is in quietly steady demand at about 2s. 2d. per lb. Tartaric acid meets with some inquiry, with quotations ranging from 1s. 4¼d. to 1s. 4½d. per lb.

Buying interest in creosote oil, both on home and export account, is poor, and prices are weak at 2⅞d. to 3d. per gallon, naked. Pitch, also, is slow and nominal at about £1 11s. per ton. Carbolic acid crystals find a ready market and values are very firm at 6¾d. per lb., f.o.b., 60's crude ranging from 1s. 11d. to 2s. per gallon. Solvent naphtha is steady and in moderate request, with offers locally at about 1s. 3½d. per gallon, naked.

Company News

Anglo-Chilean Consolidated Nitrate Corporation.—The report shows that in 1928 the deficit was $254,946 before deducting depreciation and depletion charges totalling $2,476,087, as compared with the 1927 deficit of $1,884,350 before deduction of the said charges.

Tarapaca and Tocopilla Nitrate Co.—The year's trading resulted in a gross profit (including interest and transfer fees) of £110,070, and, after deduction of London expenses, debenture interest, discount interest, etc., and Chilean income tax, £35,330, a net profit remains of £74,740; £23,119 was brought in, making £97,859. The amount transferred to debenture sinking fund is £34,000, leaving £63,859. A sum of £31,859 is to be carried forward. The annual meeting will be held at River Plate House, London, E.C., on May 13, at 12 noon.

The Chemical and Metallurgical Corporation, Ltd.—The report of the directors for the year ended December 31, 1928, states that at the date of the last balance sheet the total share capital issued was £570,998. During the year additional capital to the amount of £90,003 was raised by the issue of ordinary shares at a premium of £150,022. The premium on ordinary shares stands at £228,915. The balance sheet shows that the total net expenditure for the year was £69,193. Cash at bankers is shown at £4,771, while the bank account is £30,000. The dividend on the 8 per cent. preference shares is three years in arrear. The annual meeting will be held at Winchester House, London, on May 14, at 12 noon.

Magadi Soda Co.—The report for the year 1928 shows a profit of £92,532, after providing £13,733 for obsolescence and £29,997 for debenture interest. After adding balance of £1,381 brought forward, there is £93,913. The directors recommend providing for the following gross dividends: 6 per cent. for each of the years 1927 and 1928 on first cumulative preference shares, 6 per cent. for 1927 and 1928 on second cumulative preference shares, 12½ per cent. dividend for year 1928 on preferred ordinary shares. The directors recommend carrying forward £24,505, and that no dividend be paid on the ordinary shares. During the year £42,739 was spent on further additions to plant and machinery, including second dredger, additional power units, and a warehouse at Lake capable of holding 3,000 tons of soda ash in bags. Leases, under which the company's rights and title to work Magadi Soda deposit were perfected, were signed and stamp duty paid thereon amounted to £10,978.

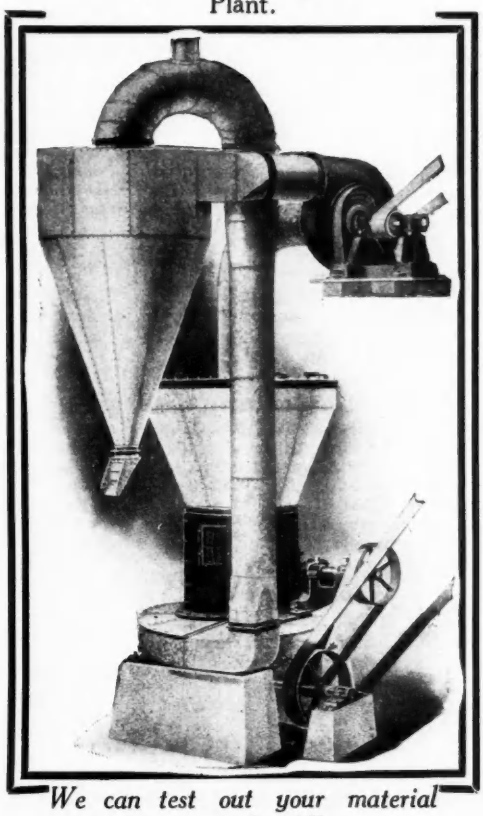
B. Laporte, Ltd.—The profit and loss account for nine months (after making the usual transfer to reserve account) and after charging directors' fees and making adequate provision for depreciation and doubtful debts, shows a balance of profit amounting to £18,390, to which must be added the balance of profit and loss brought forward from last account, £4,479, making a total of £22,869. From this is deducted dividends on preference shares (already paid) for the six months ended December 31, 1928, £4,830, leaving a balance of £18,039. It is proposed to allocate this as follows:—to pay a dividend on the ordinary shares at the rate of 8 per cent. per annum (payable less income tax) for the nine months ending March 31, 1929, £5,520; to transfer to Income Tax suspense account, £2,000; to transfer to investment reserve account, £500; to write off patents account, £500; leaving to be carried forward to next account, £9,519. In view of inconveniences in office working, it has been decided to close the books of the company on March 31, instead of June 30, and accordingly the first time of the change necessitates a nine months' account.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Galvanisers Salts.—The Director-General, India Store Department, Lambeth, London, S.E.1, invites tenders for 40 tons of galvanisers salts. Tenders are due May 23. Forms of tender may be obtained from the above address at a non-returnable fee of 5s.

Raymond Roller Hughside Mill as installed at our Derby Test Plant.



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Grind, Classify and Convey in one operation, dispensing with bolting cloths and reels and labour necessary to operate them.

Some of the materials now being ground economically by Raymond Roller Mills:—

Barium Sulphate, Barytes, Chalk, Lithopone, Ochres, Oxides, Peroxides, Phosphate Rock, Soapstone, Talc, White Lead, Zinc Oxide, etc., etc., etc.

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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

MATTHEWS AND WILSON, LTD., 15, New Broad Street, E.C., manufacturing chemists. (C.C., 11/5/29.) £14 6s. 4d. March 26.

MESSIAS, Ralph, 1, Jubilee Mansions, Jubilee Street, E., and 35, Fendall Street, Bermondsey, manufacturer of perfume and toilet requisites, etc. (C.C., 11/5/29.) £50 7s. 10d. March 25.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case, the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

BROOKES CHEMICALS, LTD., Lightcliffe. (M., 11/5/29.) Registered March 27, agreement securing 7 per cent. interest on £4,200, being interest in arrear on £50,000 debentures, to J. Rank, Colley Corner, Reigate Heath, corn miller; general charge. *£50,000. January 14, 1929.

London Gazette, &c.

Company Winding Up Voluntarily

ROBERT W. PHILLIPS, LTD. (C.W.U.V., 11/5/29.) By reason of its liabilities, April 23. S. T. Morris, 5, Lambeth Hill, Queen Victoria Street, E.C.4, appointed as liquidator.

Partnership Dissolved

ELLIOTT AND RELF (Albert Augustus ELLIOTT, George RELF and Bertram Harradine SELF), tallow and oil merchants, 72, Mark Lane, London, by mutual consent as from April 30, 1929. The business will be carried on by G. Relf and B. H. Self.

New Companies Registered

BEAVER PAINT CO., LTD., 20, Tithebarn Street, Liverpool.—Registered May 2. Nominal capital, £100 in £1 shares. To acquire the trade mark "Beaver" and the goodwill of the businesses concerned in the goods for which the same have been registered and granted, to carry on the business of oil importers and refiners, paint manufacturers, etc., and to enter into a deed of assignment with R. Davidson and Co., Ltd. Directors:—H. S. Davidson, C. K. N. Davidson, R. J. Fer.

BITUCRETE, LTD.—Registered as a "private" company on May 2. Nominal capital of £50,000 in 1s. shares. To acquire the undertaking, patents and certain assets of Lilomite Roads (Parent), Ltd., and Northstrand Trust, Ltd.; to adopt agreements (1) between Lilomite Roads (Parent), Ltd., of the one part and International Bitumen Emulsions, Ltd. (for this company) of the other part, and (2) between Northstrand Trust, Ltd., of the one part and the said International Bitumen Emulsions, Ltd. (for this company) of the other part, and to carry on the business of manufacturers of and dealers in road-making and paving materials, tar bitumen, emulsions of tar or bitumen, asphalt, etc. A subscriber:—J. Coleman, 56A, Larkhall Rise, Clapham, London, S.W.4. The first directors (to number not less than three nor more than seven) are:—G. S. Hay, G. Gemmell and C. Hill (nominees of International Bitumen Emulsions, Ltd.) and H. J. Buckmaster.

LLEWELLYN (NIXON), LTD.—Registered as a "private" company on May 3. Nominal capital, £400,000 in £1 shares. Colliery proprietors, miners, smelters, patent fuel manufacturers, brickmakers and quarrymen, manufacturers of chemicals and manures, distillers, dye makers, gas makers, timber merchants, etc. A subscriber: G. Llewellyn, Brynteg, Merthyr Tydfil.

SCOTTISH ANIMAL PRODUCTS, LTD., 75, Croft Street, Glasgow.—Registered in Edinburgh on May 3. Nominal capital, £10,000 in £1 shares. The objects are to acquire the business of tallow melters, bone boilers and chemical manufacturers and merchants carried on by A. G. McDicken at Glasgow. Directors:—R. Wilson, West Hurlet, Nitshill, Renfrewshire, R. C. Wilson, and A. C. Wilson.

Canadian National Research Council

Report for 1927-28

THE report of the Canadian National Research Council, Ottawa, for the official year 1927–28, indicates that, in addition to its general responsibilities, the National Research Council is assigned by the Research Council Act the duties, among others, of promoting the utilisation of Canadian natural resources; conducting researches into industrial technical processes and methods; investigating and determining standards and methods of measurements, etc.; standardising of scientific and technical apparatus and instruments, and determining standards of quality of materials used in public works construction and the Government service; and making researches for the improvement of agriculture.

The work of the Council during the past year included the organisation and stimulation of co-operative research work on major problems through associate research committees; stimulation of research work by research grants for special equipment or technical assistance to qualified research men working in established laboratories and post-graduate training of research workers by the award of graduate scholarships in science and research to graduates who have completed a university course in science with distinction.

At the close of the year there were organised, under the National Research Council, 24 associate committees with a total membership of 363, all of whom gave their time and experience without remuneration. There were also in active operation in laboratories from coast to coast 88 specific investigations, each directed without remuneration by a highly-trained specialist. At the same time 48 post-graduate research scholarships were also in active operation under the Council's auspices with the object of training outstanding university graduates in science and research, in order to build up in Canada a corps of men thoroughly qualified to undertake such work.

The total research organisation actively at work under the National Research Council numbered 570, of whom 465 persons served without remuneration. Since the close of the official year 750,000 dollars has been provided by the Canadian Parliament as an initial vote for the erection of national research laboratories.

Turnover in the German Potash Industry

WITH a record year just passed showing sales of 1,420,000 metric tons of K_2O against 1,230,000 tons in 1927, the proceeds of the German potash industry averaged 16 marks per 100 kilos K20 in 1928 as against 15½ marks in 1927. The price increase may be attributed to the favourable effect of the Franco-German potash pact in export markets. It is estimated that the sales value of German potash in 1928 amounted to 230,000,000 marks, as against 190,000,000 marks in 1927. Profits were increased by sales of syndicated and non-syndicated by-products of the potash industry, including magnesium chloride, bromine, bitter salts (magnesium sulphate, tech.), Glauber salt (sodium sulphate), caustic potash, etc. This group of products yielded probably 15,000,000 marks gross profit. Sales of rock salt, concurrent in German potash mining, also yielded another 15,000,000 marks, so that the entire industry with by-products showed a gross value of 260,000,000 marks, against a corresponding pre-war figure of but 200,000,000 marks. Out of the 1928 German potash fertiliser sales, the domestic market took 61 per cent. and 39 per cent. was sold abroad.